SEE FOLLOWING NOTE

PLEASE NOTE THAT PAGINATION APPEARS IRREGULAR, BUT THE TEXT IS COMPLETE.

VOIR NOTE CI-APRÈS

VEUILLEZ NOTER QUE LA PAGINATION EST ERRONÉE MAIS LE TEXTE EST INTÉGRAL.

Micromedia
ProQuest

789 East Eisenhower Parkway
PO Box 1346
Ann Arbor, MI 48106-1346 USA
toll free: 1-800-521-0600
fax: (734) 997-4247
web: www.micromedia.ca

Fish & Wildlife Division

RESOURCE DATA AND SPECIES AT RISK SECTION

MULTISAR:

A Multi-Species Conservation Strategy For Species at Risk

2005-2006 Report

Alberta Species at Risk Report No. 108

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Alberta Conservation Association
Conservation Through Collaboration

106-06793/

A Multi-Species Conservation Strategy For Species at Risk

2005-2006 Report

Brad A. Downey, Brandy L. Downey, Richard W. Quinlan, Terry B. Clayton, Christy L. Sikina and Paul F. Jones (eds.)

Alberta Species at Risk Report No. 108

March 2006

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT
Fish & Wildlife

Alberta Conservation Association
Conservation Through Collaboration

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT
Public Lands & Forests

Publication No. I/237
ISBN No. 0-7785-4532-6 (Printed Edition)
ISBN No. 0-7785-4533-4 (On-line Edition)
ISSN 1496-7219 (Printed Edition)
ISSN1496-7146 (Online Edition)

Illustrations by: Brian Huffman

For copies of this report, contact:

Information Centre- Publications
Alberta Environment/ Alberta Sustainable Resource Development
Main Floor, Great West Life Building
9920-108 Street
Edmonton, Alberta, Canada T5K 2M4
Telephone: (780) 422-2079

OR

Visit our web site at:
http://ww3.gov.ab.ca/srd/fw/riskspecies/

OR

Visit the MULTISAR website at:
http://www.multisar-milkriverbasin.com

Suggested citation formats:

Entire report

Downey, B. A., B. L. Downey, R.W. Quinlan, T. B. Clayton, C. L. Sikina and P. F. Jones (eds.). 2006. MULTISAR: A Multi-Species Conservation Strategy For Species at Risk 2005-2006 Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No.108, Edmonton, AB. 88 pp.

Chapter of report

Downey, B.L. 2006. Ferruginous Hawks. Pages 31-34 *In* Downey, B. A., B. L. Downey, R.W. Quinlan, T.B. Clayton, C.L. Sikina and P. F. Jones (eds.). 2006. MULTISAR: A Multi-Species Conservation Strategy For Species at Risk 2005-2006 Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No.108, Edmonton, AB. 88 pp.

Table Of Contents

List of Figures III
List of Tables IV
List of Appendices V
Acknowledgements VI
Executive Summary VII

CHAPTER 1 : OVERVIEW

Introduction 2

MULTISAR Program Area 4
Brad A. Downey and Brad N. Taylor

CHAPTER 2: CONSERVATION PROGRAM

MULTISAR Conservation Program 10
Brandy L. Downey, Paul F. Jones, Brad A. Downey, and Richard W. Quinlan

CHAPTER 3: WILDLIFE INVENTORIES

Aerial Raptor Survey 24
Brad A. Downey and Richard W. Quinlan

Ferruginous Hawk Surveys 31
Brandy L. Downey

Grassland Bird Surveys 36
Brandy L. Downey

Richardson's Ground Squirrel Surveys 40
Brad A. Downey

Northern Leopard Frog Surveys 43
Brad A. Downey and Brandy L. Downey

Plains Spadefoot and Great Plains Toad Surveys 46
Brad A. Downey

CHAPTER 4: FISHERIES

Fisheries Investigations in the Lower Milk River, Alberta, in 2005 54
Christy L. Sikina and Terry B. Clayton

CHAPTER 5: FUTURE DIRECTION

2006-2007 Objectives **84**

List of Figures

Figure 1.1: MULTISAR Program Area. 4

Figure 2.1: The MULTISAR Conservation Process. 12

Figure 3.1: The number of nests found each year on 14 quadrats in the MULTISAR program area. 32

Figure 3.2: Great Plains Toad and Plains Spadefoot locations within the MULTISAR Area (2005). 47

Figure 3.3: 2005 Great Plains Toad locations relative to other Great Plains Toad populations within the MULTISAR Area. 48

Figure 4.1: Distribution of western silvery minnow captured in the Milk River, 2005…59

Figure 4.2: Distribution of stonecat captured in the Milk River, 2005……59

Figure 4.3: Length frequency histogram for western silvery minnow captured in the Milk River, 2005. 60

Figure 4.4: Length-frequency histogram for all western silvery minnow captured in the Milk River during the month of October 2000, 2001, 2002 and 2005. Ages based on scales and length frequency histograms. 61

Figure 4.5: Length frequency histogram for stonecat captured in the Milk River, in 2005……64

Figure 4.6: Mean daily water temperatures in the Milk River recorded at Deer Creek Bridge, Aden Bridge and Pinhorn Ranch, 2005. 64

Figure 4.7: Daily minimum and maximum water temperatures in the Milk River, 2005……65

Figure 4.8: Preliminary mean daily discharge for the Milk River at the Town of Milk River and at the Eastern Border Crossing, recorded from 1 April to 31 October 2005……66

List of Tables

Table 2.1: Communication with landowners and community groups in the MULTISAR Area (2002-2006). 13

Table 2.2: Other MULTISAR presentations (2002-2006). 13

Table 3.1: Number of raptors observed on the Milk River/ North Milk River 2005 aerial raptor survey between Verdegris Coulee and the United States Border. 25

Table 3.2: The number of raptors observed on the Milk River/ North Milk River aerial raptor survey between Verdegris Coulee and the United States Border over the last 4 surveys. 25

Table 3.3: Number of raptor nests observed on the Milk River/ North Milk River aerial raptor survey between Verdegris Coulee and the United States Border over the last 4 surveys. 26

Table 3.4: The number of ferruginous hawk nests and adults detected during the ferruginous hawk quadrat survey on 14 quadrats (2000-2005). 32

Table 3.5: Detections of grassland bird species within the MULTISAR program area. .. 37

Table 3.6: Richardson's ground squirrel trends within the Milk River Basin and surrounding basins. 41

Table 3.7: Richardson's ground squirrel trends in other areas of Alberta, Canada. 41

Table 3.8: Northern leopard frog current use of historical wetlands in the MULTISAR program Area. 43

Table 3.9: Relative abundance classification used in the survey of great plains toads and plains spadefoot within the MULTISAR program area, Alberta 2005[1] 47

Table 3.10: RANA designated grassland transects 48

Table 4.1: Seasonal composition of fish species caught from the Milk River, 2005. 56

Table 4.2: Seasonal catch per unit effort (# fish/100 m^2) for fish species caught by beach seining in the Milk River, 2005. 58

Table 4.3: Diurnal catch per unit effort (# fish/trap/24 hours) for fish caught in minnow traps in the Milk River, 2005. 59

Table 4.4: Catch per unit effort (# eggs/net/hour) for fish eggs caught in drift nets from the Milk River, 2005. 59

Table 4.5: Biological data of western silvery minnow examined internally, from Bear Creek Confluence 22 June 2005. 61

List of Appendices

Appendix A 19

Appendix B 28

Appendix C 52

Appendix D 75

Appendix E 76

Appendix F 79

Appendix G 81

Acknowledgements

Funding for MULTISAR was provided through The Government of Canada Habitat Stewardship Program, the Alberta Fish and Wildlife Species at Risk Program, the Alberta Conservation Association and the North American Waterfowl Management Plan.

Richard Quinlan (Sustainable Resource Development – Fish and Wildlife Division – SRD-FWD), Barry Adams (Sustainable Resource Development -Public Lands and Forestry Division- SRD-PLFD), Joel Nicholson (SRD-FWD), Terry Clayton (SRD-FWD), and Paul Jones (Alberta Conservation Association - ACA) developed, coordinated, supervised and administered the MULTISAR Program. Throughout the development of the program Brad Downey (ACA), Julie Landry-Deboer (ACA), Linda Cerney (ACA), Terry Hood (SRD-PLFD), Richard Ehlert (ACA), Jen Carlson (SRD-PLFD) and Brandy Downey (SRD-FWD) provided valuable contributions, particularly with respect to field logistics, as well as the development and implementation of the conservation program. Thank you to Leo Dube (SRD-FWD), Kim Morton (SRD-FWD), Kathryn Romanchuk (SRD-FWD), Christy Sikina (SRD-FWD), and Nic Barnes (ACA), who were involved in the wildlife and fisheries inventories.

Thank you to Clare, Kathy, and Steven Tannas of Eastern Slopes Rangeland Seeds for completing the habitat assessments and to Cows and Fish for providing historical information and aerial photos on the participating ranches. Thank you to Jamie Meeks (County of Warner), Keston Prince (County of Warner) and Bruce Cairns (SRD-PLFD) for sharing your knowledge and experiences with MULTISAR team. A special thanks goes out to all of our cooperating landowners who have allowed the MULTISAR team access to their land and have helped in the development and implementation of management actions on these lands.

MULTISAR is a collaborative effort of three agencies and many other participants. It is succeeding because of the co-operative teamwork of all partners. This demonstrates a special open - minded attitude that goes beyond commitment and pride in any one organization, and is indicative of a desire in our society for multi-species and landscape-level conservation.

Executive Summary

MULTISAR outlines a process to provide appropriate management on critical parts of the landscape to achieve multi-species conservation. The program began as a concept within Alberta's Habitat Stewardship Program committee, and was subsequently designed by Alberta Fish and Wildlife and Alberta Conservation Association biologists. It has been delivered through a concerted effort involving permanent and program staff of Alberta Conservation Association, Alberta Fish and Wildlife Division, and Alberta Public Lands and Forests Division plus private biologists in the disciplines of wildlife, fishery, and range science.

The first 2 years of the program were focused on the development of necessary tools in which to conserve multiple species at the landscape level. This included the development of Habitat Suitability Index (HSI) Models, a prioritization for conservation initiatives in the program area (Multi-species Conservation Value (MCV)) and Beneficial Management Practices (BMP's) (Quinlan et al. 2003, Quinlan et al. 2004, RCS 2004 and Downey et al. 2005). The development of the MCV and BMP's paved the path for the next step in this process. Conservation programs were initiated on 61,280 acres selected through application of the MCV in the 3rd year of the program. Year four of the program focused on the finalization of the first three MULTISAR Habitat Conservation Strategies, defining the MULTISAR conservation process and recruiting future cooperators for the stewardship program. To date the MULTISAR team has completed 3 Habitat Conservation Strategies, collaborated with several local groups on education programs, implemented numerous improvements, communicated with a large number of local residents and continued to monitor species at risk within the program area. Additionally, during year 4, the stewardship program was renamed the MULTISAR conservation program. The program was redefined and the process was broken into 5 key elements: 1) awareness and education, 2) inventory and monitoring, 3) habitat conservation, 4) implementation and action, and 5) evaluation. The process was developed to provide a variety of stewardship options for potential cooperators to choose from. This report includes the definition of the 5 elements of the MULTISAR conservation program, highlights of the conservation program, a guide to the future direction of MULTISAR and a summary of the wildlife and fisheries inventories conducted for the MULTISAR program.

CHAPTER 1

OVERVIEW

INTRODUCTION

MULTISAR is a process to provide appropriate management for multiple species at the landscape level. The first two years (2002-2003, 2003-2004) of the program concentrated on the development of the MULTISAR process through baseline wildlife inventories (Quinlan et al. 2003, Quinlan et al. 2004), construction of Habitat Suitability Index (HSI) models (Downey et al. 2004), developing a landscape prioritization for conservation activities (Multi-species Conservation Value (MCV)) (Jones and Downey 2004), and publishing Beneficial Management Practices (Rangeland Conservation Services Ltd. 2004). During the past two years the focus of the program has shifted to the development and implementation of individual conservation programs.

The MULTISAR conservation program is a cooperative initiative between landowners, Alberta Fish and Wildlife, Alberta Conservation Association, and Alberta Public Lands and Forestry Division. This interdepartmental and interagency cooperation is key to the implementation of MULTISAR, and will facilitate conservation of multiple species across complete the landscape. The participation of Public Lands and Forests Division allows for the implementation of the MULTISAR habitat conservation strategies on leased land.

Initially the MULTISAR Conservation program was limited in scope to individual ranch plans that involved the development of a Habitat Conservation Strategy for all private and public land (grazing leases) managed by the participating landowner culminating with the signing of a Conservation Agreement to formally recognize that the landowner is actively protecting species at risk. MULTISAR has broadened its scope now to include a greater number of landowners by redefining its conservation program and breaking it into 5 key elements: 1) awareness and education, 2) inventory and monitoring, 3) habitat conservation, 4) implementation and action, and 5) evaluation. Though the Habitat Conservation Strategy method is still the main focus of MULTISAR these other elements include public presentations, development of educational material, small joint improvement programs, and the implementation of individual recovery team's action plans under the MULTISAR conservation program. The inclusion of these new elements will allow the MULTISAR team to influence more landowners/landowner groups and their land management decisions.

LITERATURE CITED

Downey, B.A., B.L. Downey, R.W. Quinlan, O. Castelli, V. J. Remesz and P.F Jones (eds.). 2004. A multi-species conservation strategy for species at risk in the Milk River basin: habitat suitability models for selected wildlife management species. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 86, Edmonton, AB.135 pp.

Jones, P.F. and B.L. Downey. 2004. Multi-species Conservation Value, pages 102-107 *In* Quinlan, R.W., B.A. Downey, B.L. Downey and P.F. Jones. 2004. MULTISAR: The Milk River Basin Project, A Multi-species Conservation Strategy for Species at Risk: Year 2 Progress Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton, AB.

Quinlan, R.W., B.A. Downey, B.N. Taylor, P.F. Jones and T.B. Clayton (eds.). 2003. A multi-species conservation strategy for species at risk in the Milk River Basin: Year 1 Progress Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 72, Edmonton, AB. 229 pp.

Quinlan, R.W., B.A. Downey, B.L. Downey and P.F. Jones. 2004. MULTISAR: The Milk River Basin Project, A Multi-species Conservation Strategy for Species at Risk: Year 2 Progress Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton, AB. 111 pp.

Rangeland Conservation Service Ltd. 2004. Beneficial Management Practices for the Milk River Basin, Alberta: A component of the Multi-Species Conservation Strategy for Species At Risk in the Milk River Basin (MULTISAR). Unpublished report prepared for Alberta Fish and Wildlife Division and Alberta Conservation Association. Airdrie, AB. 369 pp.

MULTISAR Program Area

Brad A. Downey, Alberta Conservation Association, Lethbridge, Alberta
and
Brad N. Taylor, Alberta Conservation Association, Blairmore, Alberta

1.0 GENERAL

In 2005 the MULTISAR program area expanded to include the Pakowki Basin and portions of the St Mary's Basin (Figure 1.1). This expansion was in response to additional recovery plans taken on by MULTISAR for species at risk like Western Blue Flag *(Iris missouriensis)* and Western spiderwort (*Tradescantia occidentalis*). The program area is now approximately 13,457 km^2 in size and the boundaries extend north from the United States border along the Saskatchewan border to Cypress Hills Provincial Park and west from the Saskatchewan border to Police Outpost Lake just west of Highway 2.

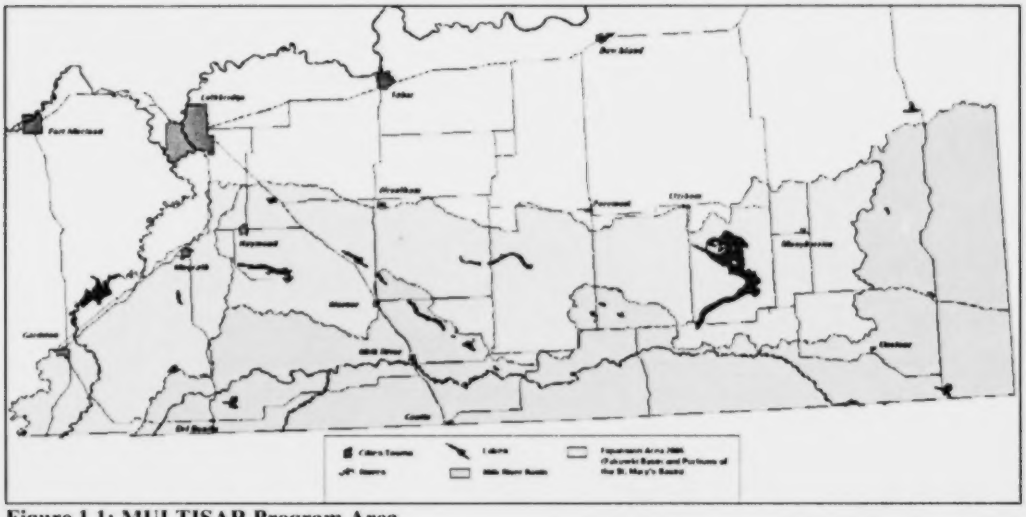


Figure 1.1: MULTISAR Program Area.

2.0 Milk River Basin

The Milk River Basin is unique to Alberta, in that it is part of the Mississippi Watershed flowing into the Gulf of Mexico. Within Alberta, it is made up of the North Milk and Milk rivers. The two forks join approximately 20 km west of the town of Milk River. The North Milk River is approximately 90 km in length, while the Milk River is approximately 271 km long (Clayton and Ash 1980). Some of the main tributaries to the Milk River include: Red Creek, Lodge Creek, Sage Creek, Shanks Creek, MacDonald Creek, Deer Creek, Bear Creek, Police Creek, Lonely Valley Creek, and Lost River.

3.0 PAKOWKI BASIN

The Pakowki Basin is considered a sub basin of the South Saskatchewan Basin, however during most years the water in the Pakowki Basin is isolated from the Saskatchewan. The Pakowki Basin contains Pakowki Lake, which is a large and shallow lake important for many migrating and nesting waterfowl. Other lakes in the basin include Tyrell, Verdigris, Crow Indian, Jensen Reservoir, and Milk River Ridge Reservoir.

4.0 ST. MARY'S BASIN

The portion of the St. Mary's Basin included in MULTISAR extends from Police Outpost Provincial Park, north to Highway 5. This area contains steep cliffs, rock ledges and rolling grassland. The majority of the western blue flag population, a "threatened" species of plant in Alberta, occurs in this area.

5.0 TOPOGRAPHY

Badlands, plains, uplands, rock cliffs, sand dunes, and valleys are all components of the program area. Badlands are evident primarily in the downstream section near Lost River and are characterized by steep slopes and heavily eroded areas. Gently undulating plains primarily occur in the northwest corner of the area south of Cypress Hills Provincial Park and in the west central portion of the drainage surrounding the town of Milk River. Uplands habitat, characterized by rolling hills, occurs in the south central portion of the drainage as an effect of the Sweet Grass Buttes in Montana and in the northeast corner along the Milk River Ridge. Rock cliffs for nesting raptors are found along the Milk River and St. Mary's River towards the US border. Sand dune complexes can be found around Pakowki Lake and can support the "endangered" western spiderwort. Large valleys can be found in the Pakowki Basin and the Milk River Basin and its tributaries. Many areas along the Milk River valley contain eroded sandstone cliffs and hoodoos. This is particularly evident in the Writing-on-Stone Provincial Park area.

6.0 VEGETATION

The MULTISAR program area is located within the Grassland Natural Region and contains areas of the Dry Mixed Grass, Mixed Grass, and Foothills Fescue subregions (Achuff 1994). The dry mixed grass ecoregion encompasses the largest area within the drainage and is represented by both short grass, such as blue grama *(Bouteloua gracilis)*, and mid-grasses like western wheat grass *(Agropyron smithii)*, June grass *(Koeleria macrantha)*, and spear grass *(Stipa spp.)*. The mixed grass ecoregion is found in the northeast corner of the area near the Cypress Hills, along the North Milk River up to Raymond, and in the south central area north of the Sweet Grass Buttes. It contains similar vegetation as the dry mixed grass subregion however, more western porcupine grass *(Stipa curtiseta)* and northern wheat grass *(Agropyron dasystachyum)* are found in this ecoregion resulting from the slightly moister and cooler climate. The fescue ecoregion makes up a small percentage of the MULTISAR program's total area. This

ecoregion is found in the western part of the program area and is dominated by grasses such as rough fescue *(Festuca scabrella),* Idaho fescue *(Festuca idahoensis),* Parry's oatgrass *(Danthonia parryi)* and intermediate oatgrass *(Danthonia intermedia).* Differences in vegetative communities are representative of differences in soils and climate (Achuff 1994).

Most of the shrubs and trees found in the program area are natural communities of thorny buffaloberry *(Shepherdia argentea),* willow *(Salix spp.),* and cottonwoods *(Populus spp.)* scattered along the riparian zones and valley draws in the program area. Silver sagebrush (*Artemesia cana*) is also prevalent throughout the area and particularly extensive in the southeast corner of the Milk River Basin. Other shrub species found in the area include rose *(Rosa spp.),* buckbrush *(Symphoricarpos occidentalis),* saskatoon *(Amelanchier alnifolia),* chokecherry *(Prunus virginiana), silverberry (Elaeagnus commutata),* and skunkbrush *(Rhus trilobata).*

Numerous forb species are present throughout the program area, three of which are of particular interest, western blue flag, western spiderwort, and soapweed (*Yucca glauca*). The majority of the population of western blue flag, western spiderwort, and soapweed are restricted to the MULTISAR program area in southern Alberta.

Introduced species, such as common caragana *(Caragana arborescens),* Manitoba maple (*Acer negundo*), Russian olive *(Elaeagnus angustifolia),* and Siberian elm *(Ulmus rubra)* are found primarily in shelterbelts and hedgerow plantings within fields or around active or abandoned farmyards. Russian olive is becoming a concern in areas where it is found in riparian zones. Other weedy species such as spotted knapweed (*Centaurea maculosa*) and yellow toadflax (*Linaria vulgaris*) are beginning to appear in the western portion of the program area (M. Uchikura, pers. comm).

7.0 LAND USE

The program area includes the towns and villages of Cardston, Magrath, Raymond, Milk River, Foremost, Warner, Coutts, Etizkom, Manyberries, Wrentham, Orion, Spring Coulee and Del Bonita. The primary land use in the MULTISAR program area is cattle grazing. Three large provincial grazing reserves (Pinhorn, Sage Creek, and Twin River), an Agriculture and Agri-food Canada research substation (Onefour), several community pastures, and numerous grazing leases preserve the majority of the natural grasslands. Only around 34% of the program area is cultivated and this activity is primarily centered between the towns of Milk River, Raymond, and Foremost. Oil and gas activity is present throughout the area and appears to be on the increase. Several important ecological areas also occur within the program area including: Writing-on-Stone Provincial Park, portions of Cypress Hills Provincial Park, the Milk River Natural Area, Woolford Provincial park, Pakowki Lake Bird Sanctuary, Police Outpost Lake, Ross Lake Natural Area and Kennedy Coulee Ecological Reserve.

8.0 LITERATURE CITED

Achuff, P.L. 1994. Natural regions, subregions and natural history themes of Alberta: a classification for protected areas management (revised December 1994). Prepared for Alberta Environmental Protection, Parks Services. 72 pp.

Clayton, T.D. and G.R. Ash. 1980. A fisheries overview of the Milk River Basin. Prepared for Alberta Environment, Planning Division, Edmonton, AB. 93 pp.

9.0 PERSONAL COMMUNICATIONS

Uchikura, M. Riparian Resource Technician, Alberta Riparian Habitat Management Program, Lethbridge, AB.

CHAPTER 2

CONSERVATION PROCESS

MULTISAR Conservation Program

Brandy L. Downey[1], Paul F. Jones[2], Brad A. Downey[2] and Richard W. Quinlan[1]
1-Alberta Sustainable Resource Development, Fish and Wildlife Division, Lethbridge, Alberta
2-Alberta Conservation Association, Southern Business Unit, Lethbridge, Alberta

1.0 INTRODUCTION

MULTISAR provides a practical system for the conservation of multiple species at risk on a landscape level. The MULTISAR process includes the following steps:

1. Summarize existing information for species at risk in the program area.
2. Carry out inventories of species at risk for which data is lacking.
3. Determine priority management species for the program.
4. Identify habitat associations of selected management species, and describe these through Habitat Suitability Index (HSI) Models.
5. Produce a map of the program area showing relative habitat suitability for each selected management species.
6. Identify areas which are highly important to individual and multiple species at risk
7. Identify natural landscape processes of importance.
8. Evaluate range management systems for their relative value in providing habitat for species at risk, and develop beneficial management practices.
9. Provide specific conservation recommendations for high priority areas.
10. Report results of the program to communities and conservation groups with an interest in the program.
11. Facilitate partnerships to achieve conservation of species at risk through voluntary conservation actions.

The preliminary MULTISAR steps (steps 1-10) were completed in 2002 and 2003 (Quinlan et. al. 2003, Quinlan et al. 2004). At the end of year 2 the tools developed by the MULTISAR team were used to develop the MULTISAR stewardship program. In 2004 the MULTISAR stewardship program was initiated. To effectively deliver the MULTISAR Stewardship program, goals were set to be delivered over a three-year period (2005-2008). The Goals are:

1. Complete Habitat Conservation Strategies and Conservation Agreements for 15% of the land base by March 31, 2008.
    a. Develop Habitat Conservation Strategies with a minimum 4 landowners.
    b. Implementation of the Habitat Conservation Strategies will be completed on 80% of these lands.
    c. Conservation Agreements will be signed with all cooperating landowners.
2. Establish 2 demonstration sites by September 1, 2006.
3. Provide information/outreach to the ranching community within the area.
    a. Distribute 1000 program brochures by March 31, 2008.
    b. Distribute 500 wildlife identification brochures by March 31, 2008.

c. Develop a Landowner Beneficial Management Practices guide by March 31, 2006.
d. Distribute 100 Beneficial Management Practices guides by March 31, 2008.

4. Create awareness of species at risk and MULTISAR through personal contacts with 50% of the program area rural residents by March 31, 2008.

As with any developing program the experience led the MULTISAR team to redefine the stewardship process in 2005. Stewardship is defined as the practice of being entrusted with the care of something of value. Good Stewards of environmental resources, such as wildlife and range, accept the role of being "caretakers" of habitat. Though stewardship is still a key component of the program the team recognized that the program was applicable outside the normal definition of stewardship and is a conservation program

2.0 ELEMENTS OF THE MULTISAR CONSERVATION PROCESS

The vision of the MULTISAR conservation program is that multiple species of wildlife, including species at risk, are effectively conserved at the landscape level, through a process that integrates range management with fish and wildlife management principles, and in a manner that contributes positively to the sustainability of the rural economy. This vision is being realized through the MULTISAR conservation process.

The creation of partnerships between rural residents, biologist, agrologist, and conservation organizations is fundamental to the success of MULTISAR process. The conservation process is flexible and dynamic. It is comprised of 5 components (Figure 2.1):

1. Awareness and Education
2. Inventory and Monitoring
3. Habitat Conservation Strategy
4. Implementation and Action
5. Evaluation

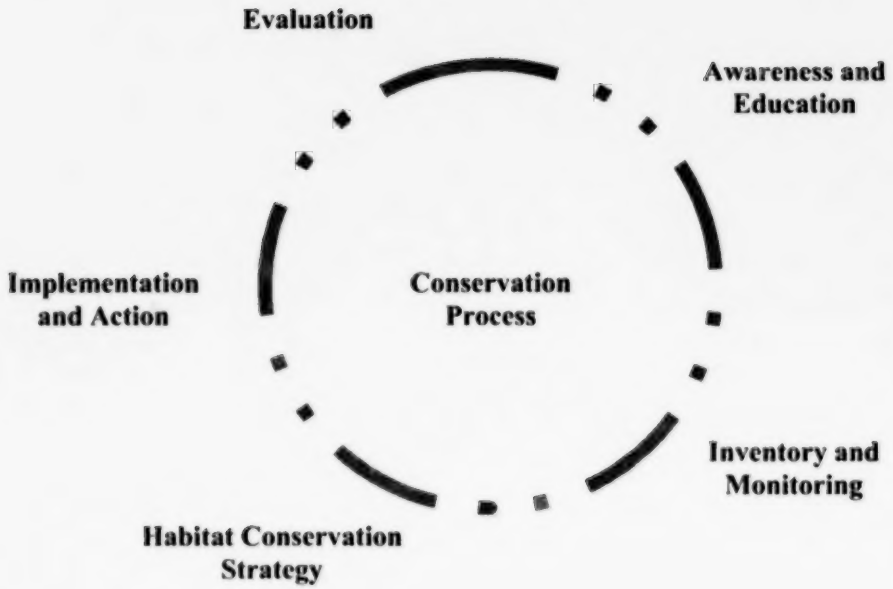


Figure 2.1: The MULTISAR Conservation Process.

2.1 Awareness and Education

Implementation of the MULTISAR conservation process relies heavily on communication between biologists, range ecologists, landowners, communities, conservation groups and industry. Effective communication provides the opportunity for local landowners and community groups to gain an understanding of which species at risk are found in their area, and how land use activities can positively and negatively affect these species. The MULTISAR conservation process includes one on one meetings, community presentations, the distribution of educational materials (e.g. brochures) and maintenance of a web site (www.multisar-milkriverbasin.com).

Two brochures were developed for landowners who live within the program area. The first is designed to explain the steps involved in the MULTISAR program and to invite landowners to become involved. The second brochure is an illustrated guide to species at risk. The MULTISAR website includes all MULTISAR publications as well as current information on program activities. A landowner friendly stewardship guide for the Grassland Natural Region is also being prepared. It will be completed in December 2006. As of March 2006 the MULTISAR team has distributed over 500 educational brochures, has had kitchen table discussions with 61 landowners, and has provided presentations to 4 community groups, 17 stakeholder groups and 1 school group (Table 2.1, Table 2.2).

Table 2.1: Communication with landowners and community groups in the MULTISAR Area (2002-2006).

Communication	Number of individuals
In-person meeting	61
Phone call	67
Provision of Brochures	608 Distributed
Presentation to community groups	12
School groups	1

Table 2.2: Other MULTISAR presentations (2002-2006).

Audience/Recipient	Presentation Date	Number in Attendance
Alberta Fish and Wildlife General Meeting	9-Oct-03	50
Alberta Fish and Wildlife staff (Medicine Hat)	20-Jan-04	12
Milk River Fish Recovery team and Municipalities	25-Mar-04	20
Southeast SRD Region General Meeting	7-Apr-04	50
Sustainable Resource Development (SRD) Executive Committee	28-Sep-04	25
The Grassland Conservation Working Group	23-Jan-04	10
The Prairie Conservation and Endangered Species Conference	27-02-04	120*
Sustainable Resource Development- Public Lands and Forestry Division	8-Mar-04	n/a
Alberta SRD Legal Services Division	1-Apr-04	3
Calgary Zoo Endangered Species Team	28-Jan-04	n/a
Government of Canada Habitat Stewardship Program	3-Mar-03	n/a
OGC Meetings - Milk River and Vauxhall	3&4-12-03	25
Southeast Region SRD Executive Caucus	16-Jan-04	15
Alberta Beef Producers	2-Feb-06	12
Minister Of Alberta Sustainable Resource Development	21-Jan-06	10
Society for Range Management World Conference	14-Feb-06	60
Endangered Species Conservation Committee	3-Mar-06	40

*3 separate presentations were made to approximately 120 people during the conference

The responses of landowners have been documented. During the first few years of the program several landowners expressed concern about the potential implications of having species at risk on their land. It was observed that many residents were poorly informed regarding jurisdictional responsibilities for wildlife, and the type of management that would be used for species at risk. This was likely a factor in 6 landowners initial decisions to deny access to their land for wildlife surveys. Over the past four years, 3 of these landowners have begun to allow the MULTISAR staff access for wildlife surveys. One of them recently requested that a Habitat Conservation Strategy be created for his land. In addition, several landowners have volunteered species at risk sightings to MULTISAR staff. This indicates that some of the concerns over species at risk that were expressed during the early years of the program have now been remedied through the education and awareness strategies of MULTISAR.

2.2 Inventory and monitoring

In order to effectively manage multiple species at risk at a landscape level the species, their habitat requirements, and use of the area must be determined. The monitoring and inventories conducted in the program area allows the MULTISAR team to gauge which areas are important for species at risk and what land use activities threaten these species. Initially the monitoring and inventory element concentrated on baseline surveys conducted throughout the area. In the short-term the information will be used to prioritize conservation activities in the program area and update information gaps in the area. In the long-term the information collected throughout the area will be used to measure the effects that improvements have on wildlife habitat and populations. Though the majority of these inventories are continued there is an increased focus on the baseline species inventories on individual ranches. Currently baseline monitoring has been completed for 2 ranches by the MULTISAR team as well as 8 ranches and 1 provincial park that were inherited from the Western Blue Flag program. Site specific monitoring has been completed for the Yucca/yucca moth initiated based on the recommendations of the Recovery team.

2.3 Habitat Conservation Strategy

This component of the process is the cornerstone to the MULTISAR program. Within this element individual ranch plans are developed through a Habitat Conservation Strategy Team consisting of the landowner, wildlife biologists, and range agrologist. This team creates a Habitat Conservation Strategy, which addresses all of the issues identified within a particular land base. In addition recovery actions from species-specific recovery plans and the MULTISAR Beneficial Management Practices are used to identify the appropriate management for a species.

Three Habitat Conservation Strategies have been completed under the MULTISAR program encompassing over 62,000 acres of native prairie. An additional 9 Habitat Conservation Strategies were completed as part of the Western Blue Flag program (9,801 acres), which are incorporated into the MULTISAR program. Three Habitat Conservation Strategies (approximately 100,000 acres) will be completed in the 2006-2007 season.

2.4 Implementation and Action

Conservation is only possible through voluntary action by the landowner and agencies. Action includes the implementation of recommendations contained within the Habitat Conservation Strategies or species recovery plans. To date 4 water developments have been completed through MULTISAR. In addition MULTISAR has taken on the responsibility of maintaining communication with 8 landowners and their 15 improvement projects from the western blue flag program. An additional water improvement was constructed by an oil company at the request of a landowner based on the recommendation from the MULTISAR team.

2.5 Evaluation

The success of the MULTISAR Conservation program will be evaluated by asking the following questions:

1) Are landowners more receptive towards species at risk management and native prairie conservation actions?
2) Are landowners implementing the recommendations in their Habitat Conservation Strategy?
3) Are more landowners coming forward to request participation in MULTISAR?
4) Are more landowners independently implementing appropriate measures for species at risk?
5) Are improvements and conservation actions having a positive effect on the habitat and species at risk?

MULTISAR staff are creating a database to track landowner meetings, reactions to the program, changes in management, and implementation of recommendations. In addition we will assess whether we achieved our goals as outlined in section 1.0.

3.0 MULTISAR PROGRAM EXTENSIONS

MULTISAR is a cooperative program that works with landowners, conservation groups, and government. Some of the processes and tools developed for MULTISAR have been expanded for use outside the program area. Habitat Suitability Index (HSI) maps have been expanded to the SRD-FWD SE Region. Beneficial Management Practices (BMP's) may be applicable throughout the ranges of the species they have been prepared for. As part of the cooperative spirit of the MULTISAR program the MULTISAR team is currently working with several groups on expanding some of the MULTISAR tools outside the program boundary. These initiatives are summarized below:

3.1 Beneficial Management Practices Working Group

Various wildlife species require different habitat types and structure for their life history requirements. Range management is a key tool in managing grassland habitat. The MULTISAR Beneficial Management Practices explain the various grazing systems available, summarize which systems benefit which species and provide some information on how industrial developments impact the selected management species. Over the past year, Canadian Wildlife Service and the Prairie Farm Rehabilitation Administration have initiated a program to develop BMP's for species at risk in the prairie region of Canada. Application of these BMPs will qualify individual landowners for financial assistance (up to $30,000) through the Canada-Alberta Farm Stewardship Program (CAFSP). The MULTISAR BMPs have been provided to the program managers for use in this initiative. A recent collaborative meeting was held between the MULTISAR team, representatives of the Counties of Cardston, Warner, Forty-mile, and Cypress, Operation Grassland Community (OGC), Milk River Council Canada: Water for Life Strategy, Cows and Fish and Prairie Farm Rehabilitation Administration. During this meeting the use of the

MULTISAR BMP's and Habitat Conservation Strategies to secure funding for individual landowners from the Canada-Alberta Farm Stewardship Program was discussed. It was decided at that meeting that a MULTISAR Habitat Conservation Strategy may be presented for consideration of CAFSP funding. Prior to being eligible for CAFSP funding a landowner must first have completed an Environmental Farm Plan (EFP).

3.2 Northern Mixed Grass Transboundary Conservation Initiative and MULTISAR

The Northern Mixed Grass Transboundary Conservation Initiative (NMGTCI) is a multi-jurisdictional and multi-agency initiative designed to achieve conservation of native prairie habitat, processes, and species at risk in the Northern Mixed Grass region (Erickson et al. 2004). It was started by The Nature Conservancy and World Wildlife Fund, and involved government agencies and conservation groups in the development of a strategy for prairie conservation. The Strategy includes portions of southern Alberta and Saskatchewan, and northern Montana. For the purpose of this program the area was subdivided into 5 conservation areas with conservation threats, goals, and strategies being developed for each (Erickson et al. 2004). The MULTISAR program area encompasses two of these sections, The Milk River and Sage Creek conservation areas (Green et al. 2004, Michalsky et al. 2004). During the process specific conservation targets were selected. Threats to conservation and potential strategies to deal with them were identified. Several of the goals and strategies for the conservation areas have been adopted by MULTISAR. Some have been further adapted to work within the MULTISAR structure. The conservation targets, threats and strategies that have been incorporated into MULTISAR are listed in Appendix A (Green et al. 2004, Michalsky et al. 2004).

3.3 Expansion of the Habitat Suitability Index (HSI) models to the Southeast Region

The HSI models are designed to identify suitable habitat for 16 species at risk within the MULTISAR program area (Downey et al. 2004). Sustainable Resource Development-Fish and Wildlife Division (SRD-FWD) has identified that these HSI models may be useful to staff and consultants in helping to identify important wildlife habitats during reviews of industrial applications. The models identify potentially suitable habitat, and they are useful for identifying which species should be surveyed for prior to new developments. SRD-FWD in cooperation with the MULTISAR team and Sustainable Resource Development Resource Information Unit (SRD-RIU) have expanded 11 of the HSI models to the Grassland Natural Region, and Parkland Natural Region boundaries. These models will be available on the MULTISAR and SRD-FWD web pages in the near future.

3.4 Recovery Teams: Action Plans

The success of MULTISAR has led several species recovery teams to request that all or part of their action plans be delivered through MULTISAR. Currently the following species recovery actions are being delivered through MULTISAR: soapweed (*Yucca glauca*)/yucca moth (*Tegeticula yuccasella*), western silvery minnow (*Hybognathus*

argyritis), western spiderwort (*Tradescantia occidentalis*), stonecat (*Notorus flavus*) St. Mary's sculpin (*Cottus spp),* and western blue flag *(Iris missouriensis).* Future recovery team requests received by the MULTISAR program managers will be considered on a case by case basis.

4.0 MULTISAR 2006-2007

The MULTISAR conservation program is a dynamic process, which considers aspects of wildlife biology and range management in order to achieve multiple species conservation. It is succeeding due to the cooperation of all partners and the open communication MULTISAR provides with local community groups and landowners. To date the program has formally recognized the proactive management for wildlife species on over 62,000 acres, and provided practical management information to over 50% of the program area. The future success of the program will rely on the continued partnerships between landowners, wildlife and range managers.

In 2006-2007 the MULTISAR team will continue to focus on the MULTISAR conservation program and achieving the long-term goals of the program. To achieve the long term goals of the MULTISAR conservation program a list of objectives for the following fiscal year (2006-2007) was developed and are included in the Future Direction section of this report.

5.0 LITERATURE CITED

Downey, B.A., B.L. Downey, R.W. Quinlan, O. Castelli, V. J. Remesz and P.F Jones (eds.). 2004. A multi-species conservation strategy for species at risk in the Milk River basin: habitat suitability models for selected wildlife management species. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 86, Edmonton, AB.135 pp.

Erickson, P., P. Fargey, S. Forrest, M. Green, B. Martin, S. Michalsky, J. Nicholson, and L. Rodger. Initative Overview and Digital Atlas. In Smith Fargey, K. 2004. *Shared Prairie - Shared Vision: The Northern Mixed Grass Transboundary Conservation Initiative.* Conservation Site Planning Workshop Proceedings and Digital Atlas. Regina, Saskatchewan: Canadian Wildlife Service, Environment Canada.

Green, M., R. Quinlan, P. Jones, L. Allen, L. Cerney, R. Bennett, B. Moffet, T. Lee Ndugga and D. Watson. Alberta Milk River Conservation Site Plan. 2004. In Smith Fargey, K. (ed.), *Shared Prairie - Shared Vision: The Northern Mixed Grass Transboundary Conservation Initiative*. Conservation Site Planning Workshop Proceedings and Digital Atlas. Regina, Saskatchewan: Canadian Wildlife Service, Environment Canada.

Michalsky, S., J. Nicholson, D. Blouin, D. Arneson, L. Veitch, J. Landry, J. Peters, S. McAdam, G. Trottier and P. Erickson. Sage Creek -Southwest Pasture Complex Conservation Site Plan. 2004. In Smith Fargey, K. (ed.), *Shared Prairie - Shared Vision: The Northern Mixed Grass Transboundary Conservation Initiative*, Conservation Site Planning Workshop Proceedings and Digital Atlas. Regina, Saskatchewan: Canadian Wildlife Service, Environment Canada.

Quinlan, R.W., B.A. Downey, B.N. Taylor, P.F. Jones and T.B. Clayton (eds.). 2003. A multi-species conservation strategy for species at risk in the Milk River basin: Year 1 progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 72, Edmonton, AB.

Quinlan, R.W., B.A. Downey, B.L. Downey, and P.F. Jones. 2004. MULTISAR: The Milk River Basin Project, A Multi-species Conservation Strategy for Species at Risk: Year 2 Progress Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton AB.

Appendix A

Northern Mixed Grass Transboundary Conservation Initiative and MULTISAR Conservation Goals

Conservation Target: Mixed Grasslands
Threat: Conversion of native grasslands to agriculture.
Strategy: Develop a no-till policy of native prairie on all public lands.

- Work with Sustainable Resource Development- Public Lands and Forestry Division (SRD-PLFD) to alter existing policy for the conversion of public land.
- Discourage policies, which allow the sale of public land.
- If public lands are to be sold or traded a conservation easement should be put in place prior to the transfer of title.

Conservation Target: Mixed Grasslands, sand dune complexes, riverine areas, aquatic refugia.
Threat: Conversion of native grasslands to agriculture.
Strategy: Private landowners will be encouraged to maintain existing native areas.

- Educate landowners on the economical viability of native grasslands.
- Aid landowner through cost share programs for environmentally friendly improvements.
- Through the MULTISAR conservation program introduce appropriate management based on habitat and species composition. Habitat types include:
    - Sand dunes
    - Riparian areas
    - Sandstone cliffs
    - Native grasslands
    - Ephemeral wetlands

Conservation Target: Mixed Grasslands
Threat: Conversion of native grasslands to agriculture.
Strategy: Marginal cropland should be reseeded to native prairie habitat (native species, not crested wheatgrass etc).

- Cost share or incentive programs should be implemented through the MULTISAR conservation program, other conservation programs in the area or by forming new partnerships with different agencies.
- Educate landowners on the negative effects of invasive species on native prairie and to grazing operations.

Conservation Target: Badland habitat and Sandstone outcrops
Threats: Industrial Development, and erosion
Strategy: Education on the importance of sandstone outcrops and badland habitat.

- Restrict/minimize recreational access to private lands.
- Develop educational materials.

- Negotiate appropriate setback distances for industry along sandstone outcrops and badland habitat.

Conservation Target: Burrowing communities
Threats: Conversion of native prairie, current and historical control practices.
Strategy: Maintenance and expansion of burrowing communities in appropriate areas.

- Education landowners on the important role burrowing communities have on the prairie ecosystem.
- Encourage mixed grazing regimes, which promote habitat for burrowing species while maintaining healthy rangelands.

Conservation Target: Riverine Habitat
Threats: Operation of drainage and diversion systems, dams and reservoirs, inappropriate grazing management.
Strategy: Introduce riparian friendly grazing management.

- Partner with Cows and Fish to educate landowners on the importance of healthy riparian habitat.
- Cost sharing for improvements, which remove cattle from riparian areas.
- Establish the MULTISAR conservation program along key riparian areas.

Conservation Target: Sage Grouse
Threats: Cultivation of native prairie, industrial developments
Strategy: Maintain sagebrush communities in and around all known active and historical sage grouse lek sites.

- Develop conservation programs and strategies to deal directly with the maintenance of sage grouse nesting habitat and leks.
- Enact industrial guidelines, which set appropriate timing and setback distances from the sage grouse leks and nesting habitat.

Conservation Target: Grasslands, Badland habitat, Sandstone outcrops, aquatic refugia, riverine areas, sage grouse.
Threats: Industrial Development, invasive and alien species
Strategy: Enact environmental guidelines for industrial development on public and private lands.

- Negotiate Conservation agreements on private land, which include setback distances, and timing restrictions for industrial developments on private land.
- Implement the Southeast Industrial Guidelines, Ephemeral Pond Guidelines, and Wind Farm Development Guidelines on all MULTISAR participants land (private and public).
- Develop appropriate guidelines for sandstone and badland habitat setbacks.
- Develop appropriate reclamation guidelines.

Conservation Target: Grasslands, Badland habitat, Sandstone outcrops, aquatic refugia, riverine areas.
Threats: Industrial Development

Strategy: Alter current road allowance guidelines to encourage the use of existing trails rather than road allowance on public and private lands.

- Develop education programs on the habitat fragmentation caused by increased roads in areas of native prairie (for individual landowners, counties and public lands).
- Partner with counties and rural areas to promote use of existing trails by developers.

CHAPTER 3

WILDLIFE SURVEYS

Aerial Raptor Survey

Brad A. Downey, Alberta Conservation Association, Lethbridge, Alberta
and
Richard W. Quinlan, Alberta Sustainable Resource Development, Fish and Wildlife Division, Lethbridge, Alberta

1.0 INTRODUCTION

Aerial surveys conducted over the last five years have provided substantial information on cliff nesting raptors along the Milk River and have identified key nesting sites for prairie falcons and ferruginous hawks (Erickson 2000, Quinlan et al. 2002, Downey and Quinlan 2003, Downey and Quinlan 2004). The Milk River valley is difficult to survey through conventional means such as vehicles or walking due to its length and limited access and aerial surveys have proven to be the most cost effective and time efficient method. This survey provides population trend data on a variety of nesting raptors and highlights key areas in which conservation activities may be warranted.

2.0 METHODS

Aerial surveys were conducted using a Bell 206 helicopter along the Alberta portion of the Milk River mainstem and associated coulees, which contained suitable nesting sites. The 2005 survey encompassed the area between Verdegris Coulee where it joins the Milk River, west along the Milk River to the United States Border, then west again along the North Milk River to the United States Border.

Cliffs suitable for nesting were searched by flying the helicopter along the cliff face and watching for birds flushing from the cliff or adults, young, eggs, or nests. Trees and shrubs along the main river valley were also surveyed for nests and birds. All individual raptors and nests were recorded. Two observers and one pilot participated in the survey. One observer was located in the left front seat of the helicopter to navigate and observe while the other observer was located in the right rear seat to observe and record sightings. Surveys were conducted from 0909-1629 hours on May 31, 2005. Fuel drums were hauled by truck to strategic locations along the survey route in order to reduce flying time.

UTM coordinates for observations were recorded using Garmin Plus II GPS units. The specific co-ordinates are stored in the Lethbridge Wildlife database and in the Fish and Wildlife Management Information System (FWMIS). Any request for specific locations should be made to the Sustainable Resource Development- Fish and Wildlife Division's (SRD-FWD) Lethbridge Wildlife Biologist.

3.0 RESULTS

A total of 6.75 hours of helicopter time was required to complete the aerial raptor survey of this portion of the Milk River Basin. Conditions were clear with excellent visibility and winds around 15km/hr gusting to 50km/hr at times. Temperatures ranged from 14°C at the start to 24°C at the end. Seven raptor species were detected in 2005 for a total of 93 individuals (Table 3.1). The most numerous were 38 ferruginous hawks followed by 25 prairie falcons, 8 Swainson's hawks, 7 great horned owls, 7 golden eagles, 5 red-tailed hawks, and 3 American kestrels (Table 3.1). There were 44 active raptor nests recorded in 2005 along the Milk River and North Milk River between Verdegris Coulee and the United States Border (Table 3.1). Eighty-four empty stick nests were also found on cliffs and the ground and seven empty stick nests in trees were observed in 2005 (Appendix B).

Table 3.1: Number of raptors observed on the Milk River/ North Milk River 2005 aerial raptor survey between Verdegris Coulee and the United States Border.

Species	# Adults	# Nests	# Young	# Eggs
Ferruginous Hawk	38	22	9	2
Prairie Falcon	25	7	10	5
Golden Eagle	7	3	3	0
Red-tailed Hawk	5	.3	3	2
American Kestrel	3	0	0	0
Great Horned Owl	7	2	3	0
Swainson's Hawk	8	7	0	0

The number of ferruginous hawks seen in 2005 is the highest since the aerial surveys were started along the Milk/North Milk River in 2000 (Table 3.2)

Table 3.2: The number of raptors observed on the Milk River/ North Milk River aerial raptor survey between Verdegris Coulee and the United States Border over the last 4 surveys.

Species	2000	2002	2003	2005
Ferruginous Hawk	28	28	19	38
Great Horned Owl	1	2	3	7
Golden Eagle	1	4	3	7
American Kestrel	5	0	0	3
Prairie Falcon	34	15	16	25
Red-tailed Hawk	10	8	6	5
Swainson's Hawk	5	14	7	8

4.0 DISCUSSION AND RECOMMENDATIONS

Ferruginous hawk nest sites increased in 2005 indicating that the population in the area is back to the 2000 level (Table 3.3). The increase in ferruginous hawks within the Milk River Basin in contrast to a decrease in their population provincially highlights the importance of the Milk River for ferruginous hawks (Downey 2006). This also indicates that the drastic climatic events in 2002, which had a negative impact on ferruginous hawk nesting were only temporary. Over time ferruginous hawks can recover from climatic events under appropriate conditions. Results from the 2006 survey will provide additional information on climatic events as the 2005 survey was completed at the end of May prior

to the substantial amount of precipitation falling in the area in June. Other factors that may be influenced by climatic events include prey abundance.

Information on ground squirrel abundance near key ferruginous hawk strongholds along the North Milk River shows the population of ground squirrels increasing from 33.7/km² in 2004 to 45.4/km² in 2005 (Downey unpublished data). Ground squirrel surveys will continue in 2006, which will allow more insight into whether weather extremes of 2005 affected the hawk's main prey.

Since 2002 there have been two good nesting years and the numbers of nests found for most raptor species in 2005 has reached or exceeded 2000 levels (Table 3.3). Prairie falcons were the only species of raptor whose nest sites have dramatically decreased along the Milk/North Milk River. Populations of prairie falcon have been low along the survey route since 2002 even with numerous holes existing along cliffs. These holes are difficult to see into and may explain the low numbers of nests found (Table 3.3).

Table 3.3: Number of raptor nests observed on the Milk River/ North Milk River aerial raptor survey between Verdegris Coulee and the United States Border over the last 4 surveys.

Species	2000	2002	2003	2005
Ferruginous Hawk	22	15	14	22
Great Horned Owl	1	0	2	2
Golden Eagle	1	1	2	3
American Kestrel	0	0	0	0
Prairie Falcon	21	9	9	7
Red-tailed Hawk	0	1	2	3
Swainson's Hawk	1	2	3	7

Aerial surveys continue to be the most effective and efficient means by which to inventory cliff-nesting raptors along the Milk River. Data collected through aerial surveys has enabled MULTISAR staff to learn the significant role these cliffs play in supporting nesting sites for raptors in a rather sparsely treed region of Alberta. These key breeding areas for prairie falcons and ferruginous hawks should be monitored annually in order to determine population trends of cliff nesting raptors.

5.0 LITERATURE CITED

Downey, B.A. and R.W. Quinlan. 2004. Aerial surveys of the Milk River Basin-2003. Pages 8-15 *In* Quinlan, R.W., B.A. Downey, B.L. Downey, and P.F. Jones. 2004. MULTISAR: The Milk River Basin Project, a multi-species conservation strategy for species at risk: year 2-progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton, AB.

Downey, B.A. and R.W. Quinlan. 2005. Aerial Raptor Survey: 2004. Pages 8-12 *In* Downey, B.L., B.A. Downey, R.W Quinlan and P.F. Jones. 2005. MULTISAR: The Milk River Basin Project, a multi-species conservation strategy for species at risk: year 3-progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton, AB.

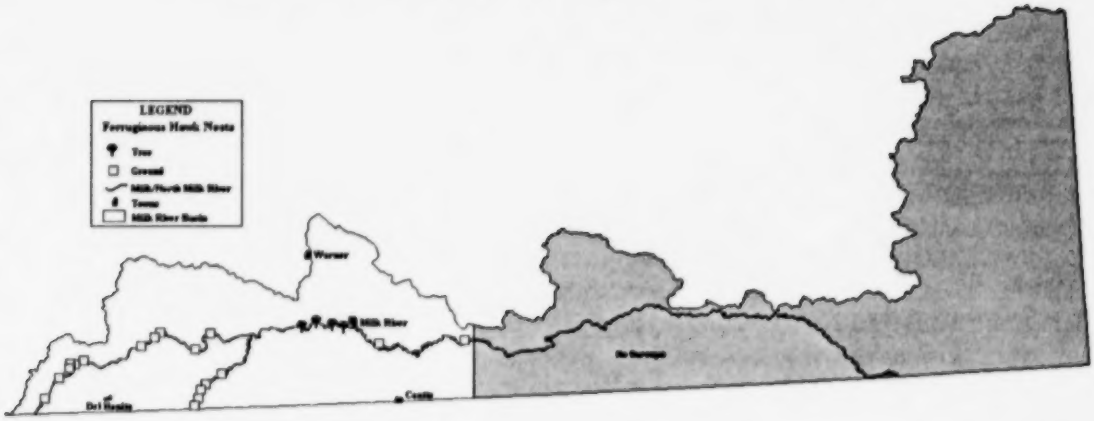
Downey, B.L. 2006. Ferruginous Hawks. Pages 31-34 *In* Downey, B. A., B. L. Downey, R.W. Quinlan, T.B Clayton, C.L. Sikina and P. F. Jones (eds.). 2006. MULTISAR: A Multi-Species Conservation Strategy For Species at Risk 2005-2006 Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No.108, Edmonton, AB. 88 pp.

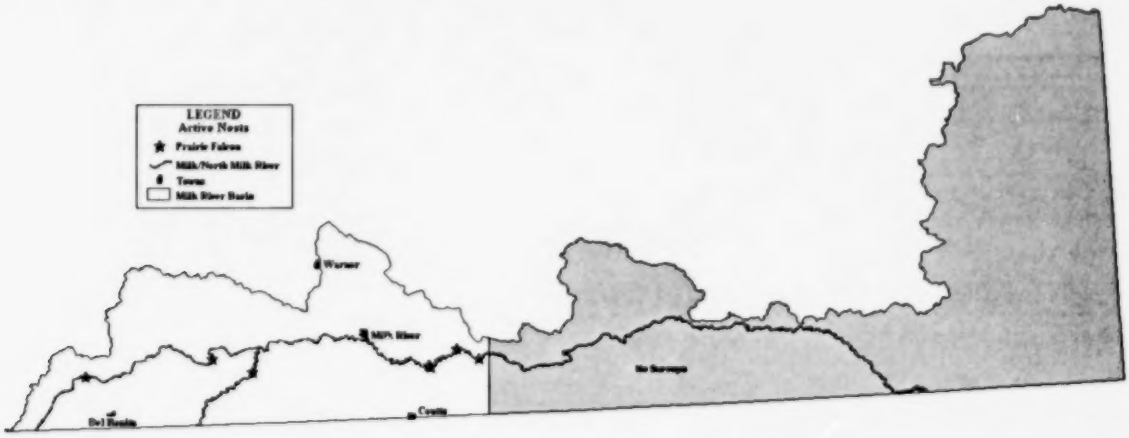
Erickson, G.L. 2000. 2000 Prairie Region Peregrine Falcon Survey. Alberta Species At Risk Program. Lethbridge, AB. 23 pp.

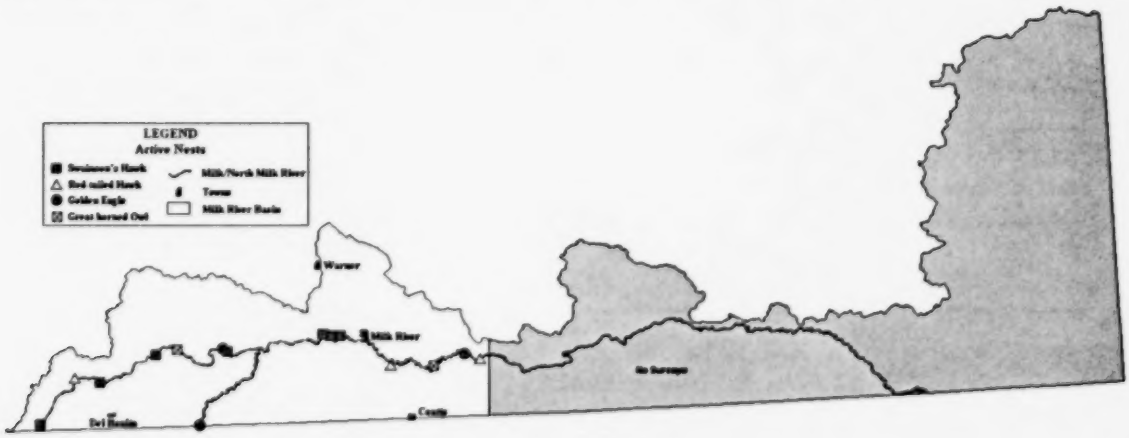
Quinlan, R.W., G.L. Erickson, and B.N. Taylor. 2003. Milk River 2002 Aerial Raptor Survey. Pages 73-84 *In* Quinlan, R.W., B.A. Downey, B.N. Taylor, P.F. Jones, and T.B. Clayton (eds.). 2003. A multi-species conservation strategy for species at risk in the Milk River Basin: year 1-progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 72, Edmonton, AB.

Appendix B

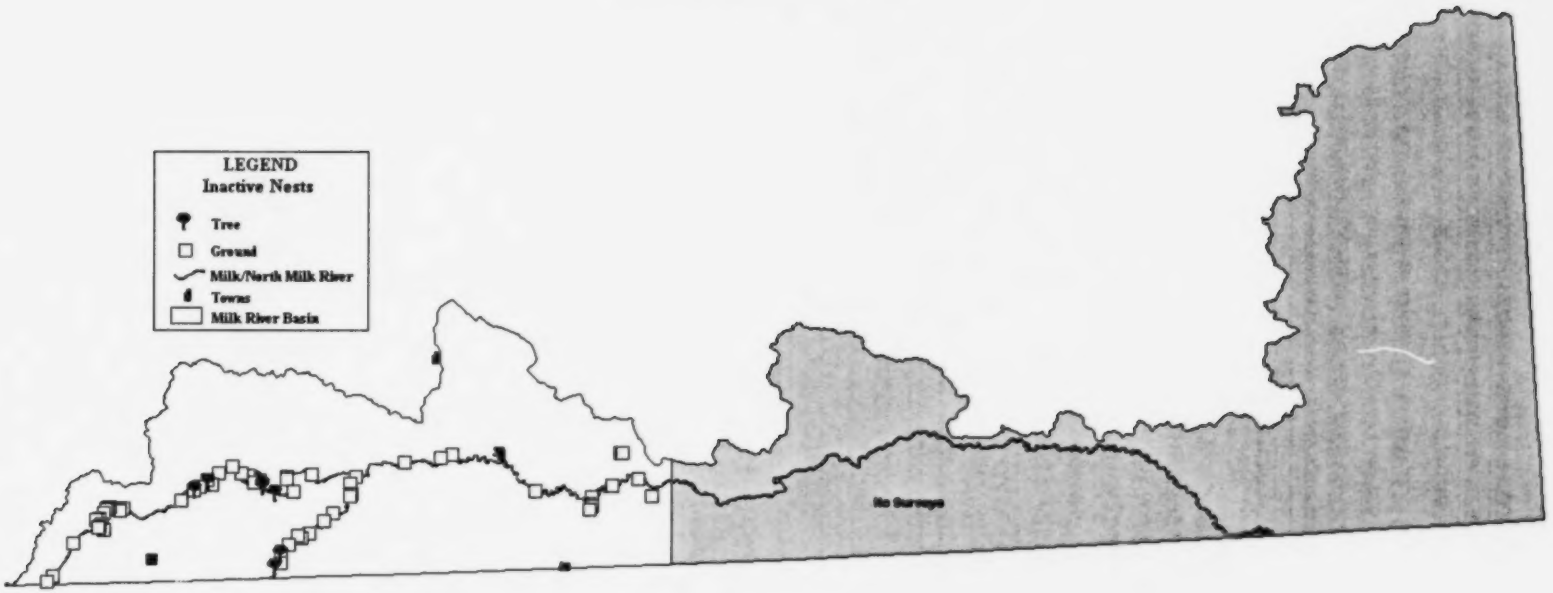
Active Raptor Nests 2005



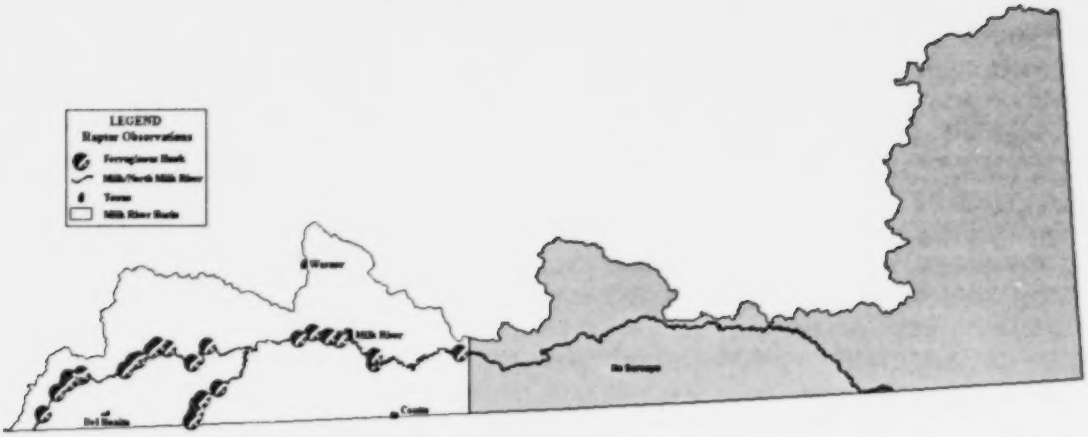


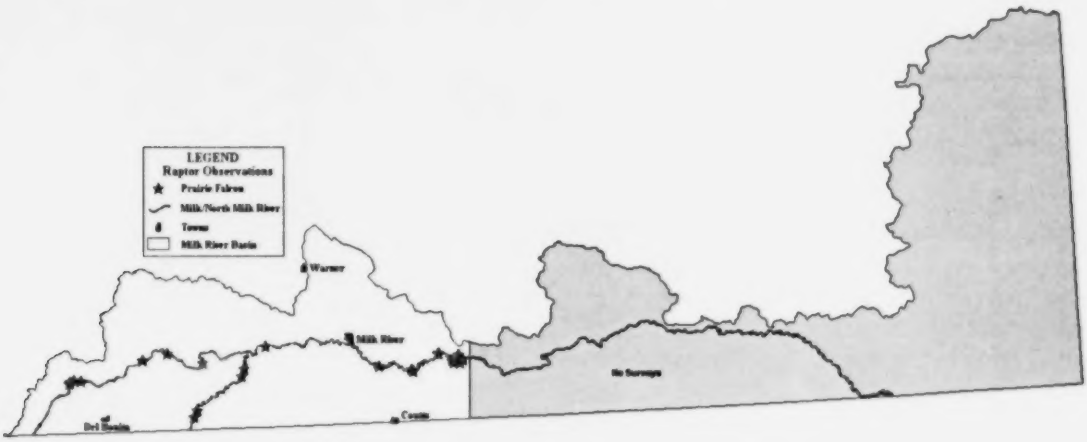


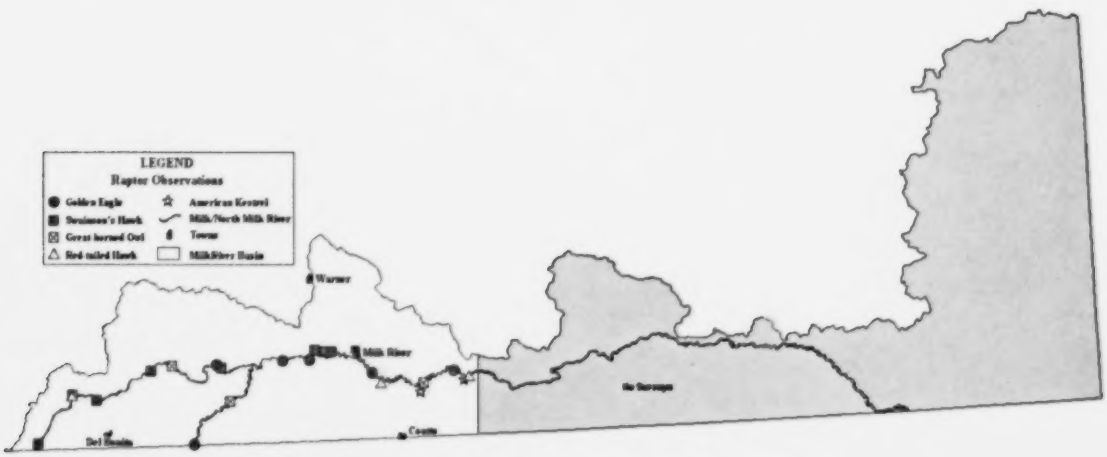
Inactive Raptor Nests 2005



Raptor Observations 2005







Ferruginous Hawk Surveys

Brandy L. Downey, Alberta Sustainable Resource Management, Fish and Wildlife Division, Lethbridge, Alberta

1.0 INTRODUCTION

In 2005 Sustainable Resource Development- Fish and Wildlife Division (SRD-FWD) conducted a provincial inventory for the ferruginous hawk, a "Threatened" species under Alberta's *Wildlife Act* (ESCC 2000) and a "Species of Special Concern" in Canada (COSEWIC 2004). One hundred and forty-seven quadrats were surveyed within the Grassland Natural Region; 31 of these fell within the MULTISAR program area and were completed as part of the MULTISAR program.

2.0 METHODS

Surveys began on May 1 and continued to July 9, 2005. Of the thirty-one quadrats surveyed within the MULTISAR program area in 2005, 15 were original quadrats surveyed since 1982 (Downey and Downey 2005, Downey 2004) and 16 were established in 2005. At the start of each survey weather conditions, number of observers, and start time were recorded. Surveys were not done during periods of rain or snow and when winds exceeded 6 on the Beaufort scale.

Each quadrat was 6.4 km x 6.4 km in size with all roads within the quadrat being traveled. In areas that were not accessible by vehicle, observers used quads, bikes or walked to access the areas. Ferruginous hawks are known to be highly susceptible to human disturbances and therefore observers were discouraged from approaching potential nests sites (Schmutz 1999, Alberta Fish and Wildlife Division 2001). Binoculars and spotting scopes were used to identify nests away from roads or trails. Observations were done from as great a distance away as possible, in order to avoid disturbance of the birds; this was generally several hundred meters away. Raptors observed were recorded on a ferruginous hawk data sheet and plotted on the corresponding quadrat map. Locations of raptors were recorded using a Garmin GPS unit in Universal Transverse Mercator (UTM, Nad 83). A list of species of interest was provided to the observers and if detected, these observations were also were recorded on the ferruginous hawk data sheet. Quadrat maps were updated to reflect structural and land use changes that had occurred since the last survey period. Previous years observation points were removed from the map in order to avoid observer bias. For new quadrats, habitat types were drawn onto the quadrat maps during the survey.

Nest habitat data sheets were completed when a ferruginous hawk nest was found. For each nest site, the type of nesting structure, height of the nest, and percentage of various habitat types within an 800 m by 800 m area of the nest was recorded. The number of young in each nest was recorded when they could be seen. Nests were considered active if new material had been added to the nest, a bird was present on the nest, or if young could be seen in the nest. In view of the potential for disturbance and nest abandonment,

trees were not climbed to get definitive information on number of young, as such information was not required for the provincial inventory. At the completion of the survey the end time and weather conditions were recorded. All data was entered in the Fish and Wildlife Management Information System (FWMIS).

3.0 RESULTS

Thirty of the 31 quadrats in the MULTISAR program area were completed in 2005. One quadrat was not completed due to extremely wet weather in June. A total of 19 nests and 32 adult ferruginous hawks were detected during the surveys. Fourteen of the 30 quadrats surveyed in 2005 had also been completed as part of the MULTISAR program and provincial inventory between 2000 and 2004 (Table 3.4). There has been a slight increase in the number of nests and adults found since 2000 (Figure 3.1). The number of nests found each year on each of these quadrats was compared using linear regression to determine the significance of the increased number of nests detected (Cerney and Jones 2001). The number of nests found on each quadrat did not differ significantly between years ($t=1.093$, $P=0.303$); therefore the population in the MULTISAR area appears to be stable.

Table 3.4: The number of ferruginous hawk nests and adults detected during the ferruginous hawk quadrat survey on 14 quadrats (2000-2005).

Year	2000	2002	2003	2004	2005
# of Adults	7	4	8	14	18
# of Nests	5	3	4	7	9

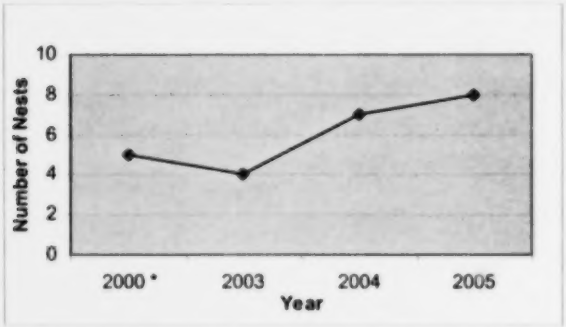


Figure 3.1: The number of nests found each year on 14 quadrats in the MULTISAR program area.

In addition to the 2005 quadrat survey an aerial survey of the Milk River Valley, between Verdigris coulee and the Canada-USA border, and the associated coulees was conducted (Downey and Quinlan 2006) 38 adults, and 22 ferruginous hawk nests were observed, primarily on sandstone outcrops along the Milk River, and in trees. During the grassland bird surveys nine ferruginous hawk adults were detected. Seventeen nests and 25 adults were also observed during other wildlife inventories within the MULTISAR program area. Results from the 2005 Provincial ferruginous hawk inventory are available in the Species at Risk Report number 101 (Downey 2005).

4.0 DISCUSSION

The 2005 provincial population and trend survey for the ferruginous hawk indicates that Alberta's ferruginous hawk population has significantly declined since 1992 (Downey 2005). The population decline observed within the last decade indicates a need for increased management emphasis on this species. The MULTISAR program area comprises approximately 15% of the provincial ferruginous hawk study area yet was home to 36% of the breeding ferruginous hawk pairs in the province of Alberta (Downey 2005). The high number of ferruginous hawk nests found in the area may be due to the high proportion of native grassland habitat available in the program area, coupled with the relatively low amount of disturbances. Several studies have shown that native prairie habitat is a key component in ferruginous hawk nest site selection in Alberta (Schmutz and Fyfe 1987, Schmutz 1993, Stepnisky et al. 2002, Downey 2005). This species has also been shown to be extremely sensitive to human disturbance during the nesting season (Howard and Wolfe 1976, Gilmer and Stewart 1983). The high amount of available native prairie habitat and the relatively low amount of human disturbance that exist in most of the MULTISAR program area make it a priority area for ferruginous hawks in Alberta.

5.0 MANAGEMENT RECOMMENDATIONS

The maintenance of native grassland habitat is key to conservation of the ferruginous hawks in Alberta (ASRD and ACA 2005). The MULTISAR conservation program should be used to secure key areas of ferruginous hawk habitat including areas of significant tree nesting, the sandstone cliff nesting areas of the North-Milk River and suitable habitat for Richardson's ground squirrel, which is the ferruginous hawk's main prey species. A detailed status review is underway for the ferruginous hawk in Alberta. Following that, a provincial recovery team will be initiated, likely in fall 2006. Once the Recovery Plan is completed, the MULTISAR management team will review identified actions and, where appropriate, actions will be incorporated into the MULTISAR program. Key management recommendation for the ferruginous hawk include:

- Continue monitoring the species within the MULTISAR program area.
- Secure key nesting areas along the North-Milk River using the MULTISAR conservation program
- Maintain suitable habitat conditions for the ferruginous hawk's main prey species the Richardson's ground squirrel.
- Adopt Recovery team actions for the species when applicable.
- Maintain and promote the growth of trees suitable for ferruginous hawk nesting.
- Promote native prairie habitat conservation throughout the MULTISAR program area for nesting ferruginous hawks. This can include conserving existing native prairie areas and the reseeding of marginal cropland to permanent native cover to increase the amount of suitable habitat in the area.
- Adhere to the timing and setback distances set out in the Alberta Fish and Wildlife Division, Southeast Regional Landuse Guidelines for all industrial developments.

6.0 LITERATURE CITED

Alberta Sustainable Resource Development and Alberta Conservation Association. 2005. Status of the ferruginous hawk (*Buteo regalis*) in Alberta. Alberta Sustainable Resource Wildlife Report # 18 (update 2005), Edmonton, AB, 19 pp.

Alberta Fish and Wildlife Division. 2001. Recommended landuse guidelines for protection of selected wildlife species within the Grassland and Parkland Natural Regions of Alberta. [online] http://www3.gov.ab.ca/srd/fw/landuse/pdf/GrasslandParkland.pdf. Accessed July 19, 2005.

Cerney, L.D. and P.F. Jones. 2003. Native prairie stewardship program: sharp-tail grouse dancing ground survey 2001-2002. Internal report. Alberta Conservation Association, Southern Business Unit. Lethbridge, Alberta, 34pp.

COSEWIC. 2004. Canadian Species at Risk, May 2004. Committee on the Status of Endangered Wildlife in Canada. 49 pp.

Downey, B.L. 2005. The 2005 ferruginous hawk inventory and population analysis. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report 101.Edmonton AB,15 pp.

Downey, B.A., R.W. Quinlan. 2006. Aerial raptor surveys: 2005, pages 24-30 *In* Downey, B. A., B. L. Downey, R.W. Quinlan, T.B. Clayton, C.L. Sikina and P. F. Jones (eds.). 2006. MULTISAR: A Multi-Species Conservation Strategy For Species at Risk 2005-2006 Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No.108, Edmonton, AB. 88 pp.

Downey, B.A and B.L. Downey. 2005. Ferruginous hawk and Richardson's ground squirrel surveys in the Milk River Basin, Pages 17-23 *In* Downey, B.L.,B. A. Downey, R.W. Quinlan and P. F. Jones (eds.). 2005. MULTISAR: A Multi-Species Conservation Strategy For Species at Risk Year 3 Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 98, Edmonton, AB.

Downey, B.L. 2004. Milk River Basin Ferruginous Hawk Surveys - 2003, Pages 25-31 *In* Quinlan R.W, B. A. Downey, B. L. Downey and P. F. Jones. 2004. MULTISAR: The Milk River Basin Project, A Multi-Species Conservation Strategy For Species at Risk: Year 2-Progress Report . Alberta Sustainable Resource Development Fish and Wildlife Division, Alberta Species at Risk Report No. 87, Edmonton, AB.

Endangered Species Conservation Committee. 2003. Species Status. [online] http://www3.gov.ab.ca/srd/fw/escc/aaisar_1.html. Accessed March 15, 2005

Gilmer, D.S and R.E. Stewart. 1983. Ferruginous hawk population and habitat use in North Dakota. Journal of Wildlife Management. 47(1): 146-157.

Howard, R.P. and M.L. Wolfe. 1976. Range improvement practices and ferruginous hawks. Journal of Range Management. 29(1): 33-37

Schmutz, J.K. 1999. Status of the ferruginous hawk (*Buteo regalis*) in Alberta. Alberta Environmental Protection, Fisheries and Wildlife Management Division, and Alberta Conservation Association, Wildlife Status Report No. 18, Edmonton, AB. 18 pp.

Schmutz, J. K. 1993. Population trends of Ferruginous Hawks in Alberta, including a synthesis for prairie Canada. Unpubl. rept. for the Committee on the Recovery of Nationally Endangered Wildlife in Canada (RENEW), Ottawa, ON. 21 pp.

Schmutz, J. K. and R. W. Fyfe. 1987. Migration and mortality of Alberta Ferruginous Hawks. Condor 89: 169-174.

Stepnisky, D.P., G.L. Erickson, J. Iwaasa and B. Taylor. 2002. An evaluation of the ferruginous hawk population in Alberta based on recent trend data. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 52. Edmonton, AB. 16 pp.

Grassland Bird Surveys

Brandy L. Downey, Alberta Sustainable Resource Development, Fish and Wildlife Division, Lethbridge Alberta.

1.0 INTRODUCTION

The long-billed curlew (*Numenius americanus*), Sprague's pipit (*Anthus spragueii*), Baird's sparrow (*Ammodramus bairdii*), upland sandpiper (*Bartarmia longicauda*), and short-eared owl (*Asio flammeus)* are endemic to the native grasslands of North America (RCS 2004). All of these species require native grassland habitat for breeding, feeding and rearing purposes; however each species requires varying grass heights, and differing amounts of bare ground. Therefore a high diversity of these species in one area indicates a healthy heterogenic grassland habitat. This is important not only for grassland birds but for many species of prairie wildlife including species at risk. Grassland birds are a key indicator of native grassland health for the MULTISAR program. Grassland bird surveys are an important part of the MULTISAR monitoring program.

2.0 METHODS

The MULTISAR survey protocol for grassland birds is based on that developed for the 2001 long-billed curlew provincial inventory (Saunders 2001), with some minor changes. The survey end date was moved changed from June 6 to May 15 resulting in a survey period of April 25-May 15. Surveys have been conducted using the same method during previous survey year except for in 2002 when the surveys were conducted by Canadian Wildlife Services (Downey 2003).

Surveys began half an hour before sunrise and generally lasted about 5 hours. At the start of each survey weather conditions were recorded and changes were noted throughout the survey. Persistent precipitation and winds in excess of 25 km/hour were considered unsuitable. If the survey was more than half completed when weather conditions turned unfavorable, it would be included in the final analysis and not repeated. Weather conditions, end time and the number of stops were recorded at the end of each survey.

Each 32km transect was divided into 40 stops, 800m apart. At each stop the observer would listen and scan for 5 minutes. If a species of interest (Sprague's pipit, long-billed curlew, upland sandpiper, short-eared owl or Baird's sparrow) was detected the stop number, number of birds, sex, activity, habitat and distance from the observation point was recorded. All birds identified within 800m or less were recorded. However, due to the likelihood of incomplete observation at distances greater than 400m, only those individuals within 400m of the observer were included in the analysis. Route regressions were used to develop population trends (Cerney and Jones 2003).

3.0 RESULTS

Seven routes were completed within the program area in 2005. Along these seven routes 28 long-billed curlews, 99 Sprague's pipit, 1 short-eared owl and 6 Baird's sparrows were detected (Table 3.5).

Table 3.5: Detections of grassland bird species within the MULTISAR program area.

Year	# of routes	LBCU	SPPI	SEOW	BDSP	UPSA
2001	8	22	14	0	N/A*	3
2002	8	7	57	0	9	0
2003	7	25	54	4	7	3
2004	7	24	108	0	1	6
2005	7	28	99	1	6	0
Average		21.2	66.4	1	5.75	2.4

* Baird's sparrows were not originally included in the monitoring programs and were added in 2002.

Single sample t-tests were conducted to determine trends for 3 of the 5 species targeted during the grassland bird surveys (Cerney and Jones 2004). These include the long-billed curlew, Sprague's pipit, and upland sandpiper. Tests were not done on the short-eared owl or Baird's sparrow due to the small sample size. T-tests were only conducted on the 5 routes that have been completed every survey year. No significant difference was found between survey years for the long-billed curlew (t =2.147, P = 0.098), and upland sandpiper (t =1.378, P = 0.240). There was a significant increase in the number of Sprague's pipit detected between survey years (t = 3.040, P = 0.036).

4.0 DISCUSSION

Based upon the routes surveyed, the trends of two key grassland bird species (long-billed curlew and upland sandpiper) have indicated a relatively stable population for the past 5 years. The population of Sprague's pipit appears to have increased significantly since 2001. This may be due to habitat recovery since the long-term drought ended in 2002. Sprague's pipits are generally found in moderate to tall native grass (Prescott 1997). The increased moisture during the last 4 years in the area would have promoted suitable nesting habitat for the species resulting in increased nesting success in the area. The current trend should be monitored in the future to determine if there is a long term Sprague's pipit population increase in the program area. The data should also be compared to the results of other grassland bird surveys outside of the MULTISAR program area to determine if the increase is occurring throughout Alberta.

The number of long-billed curlews found in the MULTISAR program area has not changed significantly over the past 4 years. There is a slight variation in the 2002 from the other 3 years of data available for the analysis. The 2002 surveys were conducted in June, which is after the suggested survey time for the species. This may explain the small difference in the number of long-billed curlews sighted; however this is not significant. The data from MULTISAR was shared with the United States Fish and Wildlife service

to assist with the 2004-2005 Continental Inventory. Preliminary results of the continental surveys indicate that a significant portion of the population reside in Alberta (Suzanne Fellows, pers. comm.). The current status in Alberta (Sensitive), Canada (Species of Special Concern), and the U.S.A. (Bird of Conservation Concern) indicates a need for management of the species (ESCC 2000, US Fish and Wildlife Service 2002, COSEWIC 2004). Recently Alberta Fish and Wildlife Division prepared a conservation management plan for the species. The recommendations from this plan will be implemented in the MULTISAR area to secure habitat for the species and promote healthy population numbers.

The Baird's sparrow was added as a key grassland bird species in 2005. Prior to this the species was recorded as an incidental by a handful of observers during the grassland bird monitoring surveys. This may explain the low numbers of detections over the past 4 years. Future monitoring surveys should include the Baird's sparrow as a key species and all observers should record any sightings. In preparation for future surveys, observers should be trained to identify the species by sight and sound to ensure that it is properly recorded.

The MULTISAR program area remains a key area for grassland birds due to its high amount of native prairie habitat. Several studies have shown that native prairie is important for long-billed curlew, Baird's sparrow, short-eared owl, Sprague' pipit and upland sandpiper (Prescott 1997, Saunders 2001). Due to the importance of native prairie habitat, steps should be taken to ensure the conservation of native prairie. This includes education of landowners to the importance of native prairie habitat, implementation of industrial guidelines, restrictions to limit habitat destruction and the initiation of stewardship programs such as the MULTISAR conservation program on both private and public lands.

5.0 MANAGEMENT RECOMMENDATIONS

- Continue monitoring grassland birds throughout the MULTISAR program area.
- Compare the Sprague's pipit data for the MULTISAR area to the data available in other regions of the province to determine if observed trends are occurring elsewhere in the range.
- Ensure all observers are trained to detect the Baird's sparrow by sight and sound.
- Maintain appropriate habitat for grassland birds using the MULTISAR conservation program.

6.0 LITERATURE CITED

Alberta Endangered Species Conservation Committee. 2000. Long-Billed Curlew Initial Conservation Action Statement. Recommended to the Minister of Environment (now Minister of Sustainable Resource Development). 2 pp.

Canadians on the Status of Endangered Wildlife in Canada. 2003. Canadian Species at Risk, May 2003.Committee on the Status of Endangered Wildlife in Canada. 43 pp.

Cerney, L.D. and P.F. Jones. 2003. Native prairie stewardship program: sharp-tailed grouse dancing ground survey 2001-2002. Internal report. Alberta Conservation Association, Southern Business Unit. Lethbridge Alberta . 34 pp

Prescott, D.R.C. 1997. Status of the Sprague's Pipit (*Anthus spragueii*) in Alberta. Alberta Environment Protection, Wildlife Management Division, Wildlife Status Report No. 10, Edmonton, AB. 14 pp.

Rangeland Conservation Service Ltd. 2004. Beneficial Management Practices for the Milk River Basin, Alberta: A component of the Multi-Species Conservation Strategy for Species At Risk in the Milk River Basin (MULTISAR). Unpublished report prepared for Alberta Conservation Association and Alberta Fish and Wildlife Division. Airdrie, Alberta. 369 pp.

Saunders, E.J. 2001. Population estimate and habitat associations of the long-billed curlew (*Numenius americanus*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife division, Alberta Species at Risk Report No. 25. Edmonton, AB.

US Fish and Wildlife Service. 2002.Birds of Conservation Concern-2002.USDOI, Fish and Wildlife Service, Administrative report, Arlington VA.

7.0 PERSONAL COMMUNICATIONS

Suzanne Fellows, US Fish and Wildlife Services, Colorado United States of America.

Richardson's Ground Squirrel Surveys

Brad A. Downey, Alberta Conservation Association, Lethbridge, Alberta

1.0 INTRODUCTION

The Richardson's ground squirrel (*Spermophilus richardsonii*) plays a crucial role in the lives of numerous species at risk within the grasslands of Alberta. Species, like burrowing owl *(Athene cunicularia)*, swift fox *(Vulpes velox)*, and prairie rattlesnake *(Crotalus viridis),* use their modified burrows for protection and raising their young (Wellicome 1997, Pruss 1999, Kissner 2004). Ferruginous hawks *(Buteo regalis)*, prairie falcons *(Falco mexicanus)*, and prairie rattlesnakes also rely on them as a major food source during the breeding season (Schmutz and Hungle 1989, Hunt 1993). Fluctuation in prey numbers can help explain fluctuation in predator populations and other wildlife that rely on them. Due to these key relationships MULTISAR has developed set transects to monitor Richardson's ground squirrel populations within the MULTISAR program area.

2.0 METHODS

Emergence of young Richardson's ground squirrels may vary 2-3 weeks between years depending on the severity of the winter and geographic location (Michener and Schmutz 2002). Surveys were therefore conducted during the first three weeks of April to ensure that all adult Richardson's ground squirrels had emerged from hibernation. This allowed the maximum adult density to be assessed each year. April surveys of adults were chosen to alleviate the high annual variation that could result later in the spring through recording of the later-emerging juveniles (Downey 2003).

Morning surveys started 75 minutes after sunrise and ended by 1200 hours. Afternoon surveys were conducted from 1600 hours until 75 minutes prior to sunset. These survey periods correspond to when ground squirrels are most actively feeding. Due to reduced levels of activity, surveys were not carried out during extremely high temperatures ($\geq$30 ^{o}C), nor were survey done when winds exceeded 30km/hr, or when it was snowing or raining (Downey 2003).

Surveys involved an observer driving and stopping every 800m along a 12.8km predetermined transect. A GPS location was taken at each stop. The observer played a recording of the alarm call of an adult Richardson ground squirrel for 30 seconds while facing each quadrant and using binoculars rotated around 360 degrees (four 90^{o} quadrants) counting each ground squirrel within 200m. In cases where quadrants couldn't be surveyed the full 200m due to obstructions, such as topography, the observer continued along the transect (up to 400m from the original site) until he/she could see 200m in each direction. Any changes in the locations of the stops were noted on the data sheet. Regular intervals of stops every 800m were continued from where the original stop was located. The number of Richardson's ground squirrels seen in each quadrant (NE,

NW, SE, and SW) was recorded on the data sheet. The dominant habitat for each quadrant and the habitat in which ground squirrels where seen were recorded.

3.0 RESULTS

Based on the ferruginous hawk survey blocks nearly twice as many ground squirrels/km² can be found in the Milk River Basin compared to the surrounding area. This corresponded to twice the number of ferruginous hawks found nesting on the survey blocks in the Milk River Basin compared to the Pakowki and St. Mary's Basin (Table 3.6).

Table 3.6: Richardson's ground squirrel trends within the Milk River Basin and surrounding basins.

Area	Year	Number of Transects	RGSQ/km²	FEHA Nests*
Milk River Basin	2004	7	8.4	5
	2005	7	12.7	6
Pakowki/ St. Mary's Basin	2004	7	6.6	3
	2005	8	6.7	3

* Found in the ferruginous hawk blocks in which the Richardson's ground squirrel transects were run.

Richardson's ground squirrel trend data from other parts of the province indicate relative steady populations in Lethbridge and Medicine Hat and higher populations in 2005 within the Hanna area (Table 3.7). However, all three had a decrease in the number of nesting ferruginous hawks with the Hanna area having the lowest number (Table 3.6).

Table 3.7: Richardson's ground squirrel trends in other areas of Alberta, Canada.

Area	Year	Number of transects/ blocks	RGSQ/km²	FEHA Nests*
Lethbridge	2004	13	10.7	9
	2005	13	10.2	6
Medicine Hat	2004	7	9.4	11
	2005	7	11.0	7
Hanna	2004	7	19.5	4
	2005	7	31.1	3

* Found in the ferruginous hawk blocks in which the Richardson's ground squirrel transects were run.

4.0 DISCUSSION

Ground squirrel trend data provides researchers with information on the health of key prey populations, which can influence many of the predator populations that rely on them. In the Milk River Basin the population of ground squirrels appears to be increasing slightly, however, surveys were conducted prior to the heavy precipitation event in 2005. Surveys in 2006 will provide insight into the effect of the precipitation event on ground squirrels, and the implication this may have on ferruginous hawk populations.

The low numbers of nesting ferruginous hawks in the Hanna area where ground squirrel numbers are high indicates that prey may not be a limiting factor in the area and that other factors must be influencing their nesting. Whether this is due to limited nest sites, disturbance, or simply the lower populations of ferruginous hawks is unknown. Other factors including heavy precipitation events in June of 2005 could have led to nest

abandonment, which may have been missed by observers if surveys were conducted in June. Continued surveys in 2006 are required to determine if this trend continues or if ferruginous hawks will now inundate the area due to the higher prey levels. Subsequently lower ferruginous hawk nests in the Lethbridge and Medicine Hat area may also be due to surveys conducted later on in June after the heavy precipitation.

Continued population monitoring of ground squirrels is an important component for any land management decisions. An adequate prey base should be confirmed prior to placement of any structures for ferruginous hawks. Simple surveys using call playback to evoke a reaction from ground squirrels is an efficient and effective method for surveying in the relatively flat grasslands of Alberta. The use of a cheap and effective method for surveying ground squirrels is key for the long-term monitoring of the species.

5.0 LITERATURE CITED

Downey, B.A. 2003. Survey protocol for the Richardson's ground squirrel. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No 69. Edmonton, AB.

Hunt, L. E. 1993. Diet and habitat use of Prairie Falcons (*Falco mexicanus*) in an agricultural landscape in southern Alberta. Thesis, University of Alberta, Edmonton, Alberta, Canada.

Kissner, K. J. 2004. Habitat suitability index model: Prairie rattlesnake (*Crotalus viridis viridis*). Pages 112-124 *in* B. A. Downey, B. L. Downey, R. W. Quinlan, O. Castelli, V. Remesz, and P. F. Jones, editors. 2004. MULTISAR: The Milk River Basin Habitat Suitability Models for Selected Wildlife Management Species. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 86. Edmonton, Alberta, Canada.

Michener, G.R. and J.K. Schmutz. 2002. Richardson's ground squirrel- *Spermophilus richardsonii*. Alberta Prairie Conservation Forum- Prairie Notes Online Paper (http://www.albertapcf.ab.ca/prairie_notes.htm).

Pruss, S. D. 1999. Selection of natal dens by the swift fox (*Vulpes velox*) on the Canadian prairies. Canadian Journal of Zoology 77: 646-652.

Schmutz, J. K., and D.J. Hungle 1989. Populations of ferruginous and Swainson's hawks increase in synchrony with ground squirrels. Canadian Journal of Zoology 67:2596-2601.

Wellicome, T. I. 1997. Status of the Burrowing Owl (*Speotyto cunicularia hypugaea*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 11. Edmonton, Alberta, Canada.

Northern Leopard Frog Surveys

Brad A. Downey, Alberta Conservation Association, Lethbridge, Alberta
and
Brandy L. Downey, Alberta Sustainable Resource Management, Fish and Wildlife Division, Lethbridge, Alberta

1.0 INTRODUCTION

Northern leopard frogs are a "Species of Special Concern" in Canada and are listed as "Threatened" under the Alberta Wildlife Act (COSEWIC 2004, ESCC 2005). They were once widespread across Alberta, but experienced a sharp decline in their population starting in 1979 (ASRD 2003). Historical records in Alberta dating back to the1920's were surveyed during the 2005 provincial survey to determine whether northern leopard frogs still persisted in these locations. As part of this provincial survey MULTISAR completed 27 sites.

3.0 METHODS

The survey followed the protocol outlined by Kendall (2002) with additional requirements for conductivity, Ph readings, and an assessment of habitat for future reintroduction where northern leopard frogs no longer exist.

3.0 RESULTS

Northern leopard frogs were found at 5 of the 27 sites surveyed in the MULTISAR program area, and 5 sites were not surveyed due to access issues (Table 3.8). Two of 5 sites, which contained northern leopard frogs, had large populations (>100 northern leopard frogs). Many of the other 21 sites that were surveyed in 2005 were found to be unsuitable for northern leopard frogs. Several wetlands were completely dried up, cultivated over, or too shallow to facilitate over wintering. In addition to the historical sites MULTISAR staff also identified a new northern leopard frog site containing six adults which was previously unrecorded.

Table 3.8: Northern leopard frog current use of historical wetlands in the MULTISAR program Area.

Northern Leopard Frog Site	Priority	Watershed	Presence/Absence
117	A	Missouri	Present
203	A	Missouri	Present
213	A	Missouri	Absent
250	A	Missouri	Absent
261	A	Missouri	Absent
262	A	Missouri	Present
273	A	Missouri	Present

274	A	Missouri	Absent
345	A	Missouri	Present
15	B	Missouri	Not surveyed
137	B	Missouri	Absent
164	B	Upper south Saskatchewan	Absent
204	B	Missouri	Absent
205	B	Missouri	Absent
206	B	Missouri	Absent
214	B	Missouri	Absent
229	B	Missouri	Absent
276	B	Missouri	Not surveyed
281	B	Missouri	No water
336	B	Missouri	Absent
356	B	Missouri	Absent
53	C	Missouri	Absent
106	C	Missouri	Absent
116	C	Missouri	Absent
122	C	Missouri	Absent
238	C	Missouri	No water
296	C	Missouri	Absent
342	C	Missouri	Not surveyed
351	C	Upper south Saskatchewan	Not surveyed
357	C	Missouri	Not surveyed
359	C	Missouri	No water
373	C	Missouri	No water

4.0 DISCUSSION

MULTISAR staff talked to several landowners with historical northern leopard frog sites on or adjacent to their lands. Many of these landowners knew of northern leopard frogs, but had not seen them for 20-30 years, correlating with the large die offs in the late 70's early 80's. Numerous sites identified as historical locations for northern leopard frogs contained limited or no water. The sites in which northern leopard frogs persisted were along flowing creeks and rivers where deep pools could develop to support them through times of drought. Due to the low numbers of northern leopard frogs found in the MULTISAR area, management objectives put forth by the recovery team should be adopted and applied within the program area.

The northern leopard frog recovery team is currently exploring areas where reintroduction of the species would likely be successful (Prescott per. comm.). Two of the sites identified by MULTISAR provide some hope, as there are large enough populations, which would be sustained if some of their egg masses were used to support reintroductions programs in nearby areas. Reintroduction projects like this have been successful in the past for other projects; like the Magrath Northern Leopard Frog Reintroduction Project, which successfully transplanted egg masses from three northern leopard frog populations to the Magrath area (Romanchuk and Quinlan 2006).

The new site identified by MULTISAR staff occurred in the Milk River Natural Region roughly 2 km between the Kennedy Creek population and the Milk River sites. The location is a spring fed watering hole for cattle that has be partially fenced off. The other five sites that MULTISAR was unable to survey in 2005 will be surveyed in 2006 during a canoe trip down the Milk River. These sites are remote and the flooding that occurred in 2005 prevented staff from reaching the sites during appropriate times.

As part of MULTISAR's Information and Education Program MULTISAR staff escorted 20 students from the Earls River High School around a heavily populated northern leopard frog site. The students were able to see first hand what type of habitat northern leopard frogs preferred, what northern leopard frogs looked like, and how to identify their eggs masses. The landowners were proud to learn that they have northern leopard frogs on their land and have indicated that they are willing to participate in reintroduction programs in the future.

5.0 MANAGEMENT RECOMMENDATIONS

- Adopt action plans of the Northern Leopard Frog Recovery Team.
- Continue educating the public on the role of permanent wetlands and the importance of sustaining habitat for the northern leopard frog in the MULTISAR area.
- Conduct surveys at the five sites that were not surveyed in 2005.

6.0 LITERATURE CITED

Alberta Sustainable Resource Development. 2003. Status of the Northern Leopard Frog (Rana pipiens) in Alberta: (Update 2003). Alberta Sustainable Resource Development Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 9 (Update 2003), Edmonton, Alberta. 61 pp.

COSEWIC. 2004. Canadian Species at Risk, May 2004. Committee on the Status of Endangered Wildlife in Canada. 49 pp.

Endangered Species Conservation Committee. 2003. Species Status. [online] http://www3.gov.ab.ca/srd/fw/escc/aaisar_1.html . Accessed March 15, 2005

Kendell, K. 2002. Survey protocol for the northern leopard frog. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report. No. 43. Edmonton, AB. 30 pp.

Romanchuk, K.A. and R. W. Quinlan. 2006. Magrath northern leopard frog reintroduction project: final report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report. No. 104. Edmonton, AB. 33 pp.

Plains Spadefoot and Great Plains Toad Surveys

Brad A. Downey, Alberta Conservation Association, Lethbridge, Alberta

1.0 INTRODUCTION

Great plains toads (*Bufo cognatus*) and plains spadefoot (*Spea bombifrons*) inhabit the Grassland Natural Region of Alberta. Legally the great plains toad is designated as "Data Deficient" in Alberta and the plains spadefoot is not listed; however, the general status of Alberta lists both as "May Be At Risk"(ASRD 2001, Fish and Wildlife Division 2004). The great plains toad is considered a species of "Special Concern" and the plains spadefoot is classified as "Not At Risk" in Canada (COSEWIC 2004). Great plains toad and plains spadefoot are elusive due to their extended periods below ground and their reliance on large precipitation events to initiate breeding activity. The population may remain underground for three to five years, which has resulted in a limited amount of information on their distribution and status. Surveys to gather more information on both species were conducted in 2002 and resulted in a substantial increase in the number of known breeding sites within the Milk River Basin (Taylor and Downey 2003).

Heavy rains again in 2005 allowed MULTISAR to team up with Researching Amphibian Numbers in Alberta (RANA) staff to resurvey the 2002 transects and an additional eight transects throughout the MULTISAR program area. MULTISAR and RANA teamed up in an effort to identified transects within the grasslands that could become RANA monitoring transects for grassland amphibians like the great plains toad and plains spadefoot.

2.0 METHODS

Road transects ranging from 16 to 52 stops were conducted in the Milk River Basin, Pakowki Basin, St. Mary's Basin, and west of Fort MacLeod for a total of 642 stops (Appendix C).

Transects in the western half of the program area were given the highest priority as spadefoot were heard at only a few locations west of the town of Milk River in 2002 due to timing and limited transects in the area. Two transects were also conducted near the town of Fort McLeod where toads were heard at a single spot in 2002. Surveyors recorded habitat at each stop along the transect prior to the evening call survey. Call surveys commenced 30-minutes after sunset and continued to 3:00am. Observers would listen for 3 minutes for calling toads every 800 m along the transect. The amount of time spent at each stop was reduced from five minutes based on Taylor and Downey's (2003) recommendations. The decrease in the amount of time at each stop was due to the removal of a two-minute waiting period at the start (offsets any disturbance), which proved unnecessary as toads could be heard overtop of the running engine at first arrival. If toads were heard, then the relative abundance (Table 3.9), species, direction they were heard, and approximate distance was recorded. Observers also recorded wind speed, weather, moonlight (full, quarter, new), time, date, and air temperature. Surveys were conducted when wind speeds were lower than level 3 on the Beaufort wind scale (gentle

breeze, leaves and small twigs in constant motion), there was light or no rain, and temperatures were close to the average for the season (*i.e.* above 10° C) (Kendell 2002).

Table 3.9: Relative abundance classification used in the survey of great plains toads and plains spadefoot within the MULTISAR program area, Alberta 2005[1].

Abundance Class	Description
I	Individual counted or heard (1)[2]
II	Two or more calling but without overlapping calls (2-5)
III	Several individuals with overlapping calls but still distinguishable (5-10)
IV	Calls are overlapping and indistinguishable (10+)
V	None heard

[1] From Taylor and Downey (2002) adapted from Kendell (2002)

[2] Numbers in brackets represent an approximate numerical breakdown of the classes and should be used with caution

3.0 RESULTS

Plains spadefoot were heard at 112 of the 642 stops (17.4 %) while great plains toads were not heard at any stops along the transects due to insufficient precipitation amounts in key breeding areas (Figure 3.2). The known range of the plains spadefoot population did expand westward with another five sites found in 2005, five kilometers from the previous westerly point in the MULTISAR area (Figure 3.2).

Great plains toads were found along the northern edge of the program area during travel to and from designated transects. An impromptu survey in-between Wrentham and Skiff was conducted as a result of the great plains toads being heard near a Hutterite colony in the area. Fourteen sites containing great plains toads and 18 sites containing plains spadefoot were found and confirmed (Figure 3.3).

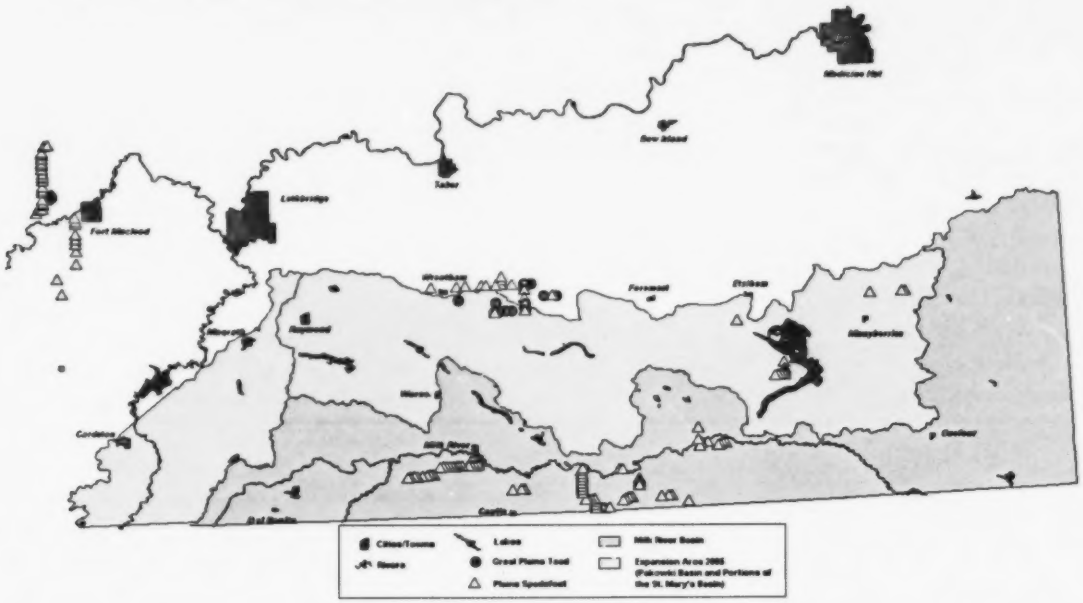


Figure 3.2: Great Plains Toad and Plains Spadefoot locations within the MULTISAR Area (2005).

All sites containing great plains toads and spadefoot identified during the Wrentham/Skiff survey occurred in cultivated lands and ditches. This great plains toad population helps fill the large gap between the Lost River/Milk River population and Hays/Purple Springs population (Figure 3.3).

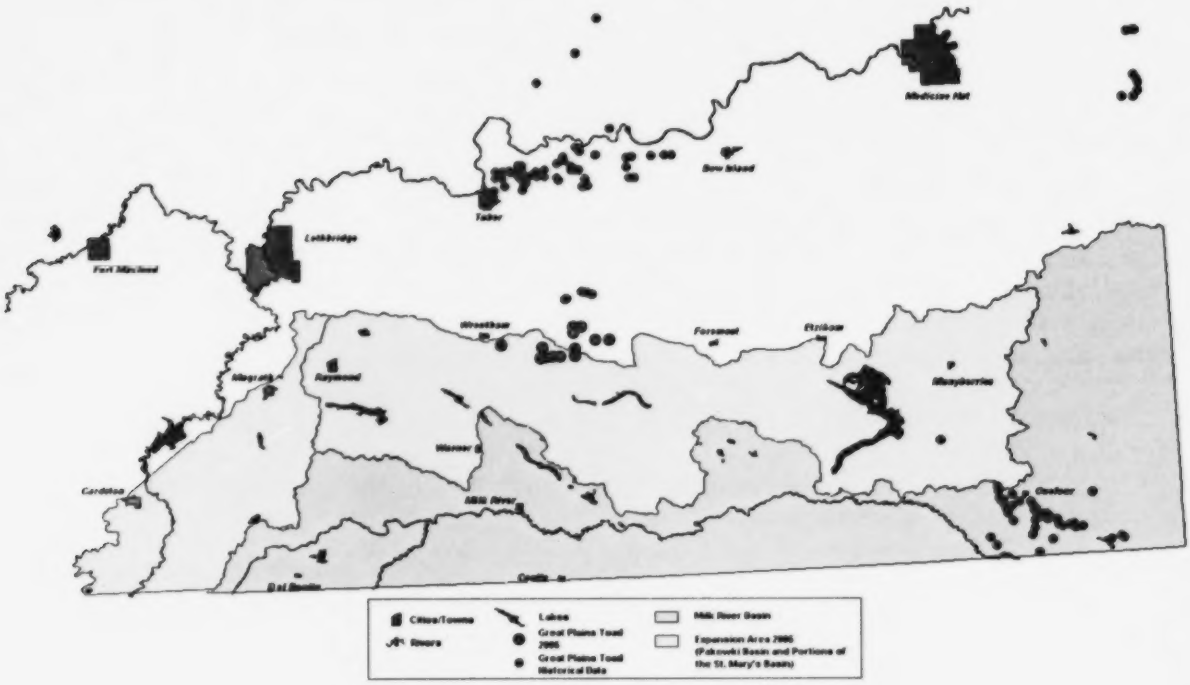


Figure 3.3: 2005 Great Plains Toad locations relative to other Great Plains Toad populations within the MULTISAR Area.

Ten transects were designated as RANA transects and are listed below along with explanations as to their selection. These ten transects are spread across the extreme southern grasslands and contained plains spadefoot and boreal chorus frogs (*Pseudacris maculata*) in 2005 and northern leopard frog (*Rana pipiens*) and great plains toads in 2002 (Table 3.10).

Table 3.10: RANA designated grassland transects

Transect #	Date completed	Species found*	Comments
2	June 12, 2005	None	Habitat was completed on June 12, but no survey was conducted. Limited precipitation in the area prevented GPTO from breeding, however this transect did contain GPTO in 2002.
6	June 21, 2005	BCFR	This transect goes through the heart of the Lost River/Milk River population of GPTO and will be a crucial transect to survey during the next heavy rains.
7	June 14, 2005	BCFR	Both BCFR and NLFRs were heard in 2002. This transect

			also has a higher elevation then other transects, similar to the Milk River Ridge. It is an excellent transect to monitor as PLSP are found further south, but fade off as you approach the Cypress Hills.
8	Not Completed	None	BCFR were found in 2002. This transect was chosen as a RANA transect as it is located near the Saskatchewan border south of the Cypress Hills.
17	June 10, 2005	PLSP, BCFR	This transect contains the known western extent of PLSP in the Milk River Basin and should be monitored for further expansion west.
18	June 10, 2005	BCFR	This transect continues west from transect 17 up into the Milk River Ridge where no PLSP have yet to be heard.
23	Not Completed	None	Was chosen as a RANA transect because it runs through the Pinhorn Grazing Reserve and has the potential for containing both GPTO, which are found to the east, and PLSP.
26	June 15, 2005	PLSP BCFR	Located around Writing on Stone Provincial Park towards the center of the Milk River Basin. This transect represents the center of the plains spadefoot range within the basin and generally contains high numbers of detections.
27	June 11, 2005	PLSP BCFR	This transect runs along the western edge of Pakowki Lake. This area was identified as having good potential for great plains toads and would help fill in the large gap between the Lost River/ Milk River population and the new population around Wrentham/Skiff.
35	June 20, 2005	PLSP BCFR	This transect is located west of Fort Macleod and has gone from one location of PLSP in 2002 to 20 sites with PLSP in 2005

*BCFR- Boreal Chorus Frog, PLSP- Plains Spadefoot, NLFR- Northern Leopard Frog, GPTO- Great Plains Toad.

4.0 DISCUSSION

Though good habitat exists for the plains spadefoot further west; the effect of elevation on the species is not understood. The current western boundary within the program area coincides with the start of the Milk River Ridge, which may act as an obstacle for the species. Surveys on top of the ridge and west toward Cardston failed to detect plains spadefoot despite abundant ephemeral ponds resulting from 278.2 mm of precipitation falling in the area between May and July 2005. Precipitation levels in the east were less then the western part of the program area and were not substantial enough to fill the ephemeral ponds, which explains the absence of spadefoot around Onefour in 2005 where numerous spadefoot were heard in 2002. Similarly great plains toads were absence at all ponds in the Onefour area where populations were heard calling in 2002.

The confirmation of great plains toads around the heavily cultivated area of Wrentham/Skiff and information on the Fish and Wildlife Management Information System (FWMIS) from the area in 2003 suggest a new known population of toads. The new population helps fill in the large gap between the Lost River/Milk River population and the other five populations in Alberta. The ability for the population to remain stable in a heavily cultivated area remains to be seen. During surveys from 1987-1990 no great plains toads were found to be using ponds in cultivated areas in Alberta (Wershler and Smith 1992). Even though great plains toads were heard in cultivated areas, these areas

tend to drain faster then native prairie, which could have dire consequences for unmetamorphized toads. There are a few large wetlands where toad development could be completed and further investigation in the area should be conducted during the next major spring precipitation event.

The absence of toads in 2005 in areas of low precipitation, where they were heard calling in 2002, continues to support a relationship between precipitation amounts and the breeding season of toads. Conservation groups and industry should be prepared to conduct extensive toad surveys in years that experience extreme precipitation events within short periods of time (i.e. 120mm in a week for great plains toads and 60mm in a week for plains spadefoot). Otherwise it may be three to five years before anyone knows what lies beneath the soils of a proposed development.

5.0 FUTURE MANAGEMENT AND RECOMMENDATIONS

- A full survey encompassing the entire grassland should be conducted in the next three to five years to determine whether toad population levels are being maintained. Ten of these transect, identified in table 2, would be RANA monitoring transects.

- A survey around the Onefour and Pakowki area should be conducted following the next major spring precipitation event (i.e. 120mm in a week)

- Conservation groups and industry should be prepared to conduct toad surveys with minimal warning due to the species moisture dependence.

6.0 LITERATURE CITED

Alberta Sustainable Resource Development. 2001. The General Status of Alberta Wildlife Species 2000. Alberta Sustainable Resource Development, Fish and Wildlife Service, Edmonton, AB, 46 pp. Publ. NoI/023.

COSEWIC. 2004. Canadian Species at Risk, May 2004. Committee on the Status of Endangered Wildlife in Canada. 49 pp.

Fish and Wildlife Division. 2004. Report of Alberta's Endangered Species Conservation Committee: June 2002. Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton, AB. 40 pp.

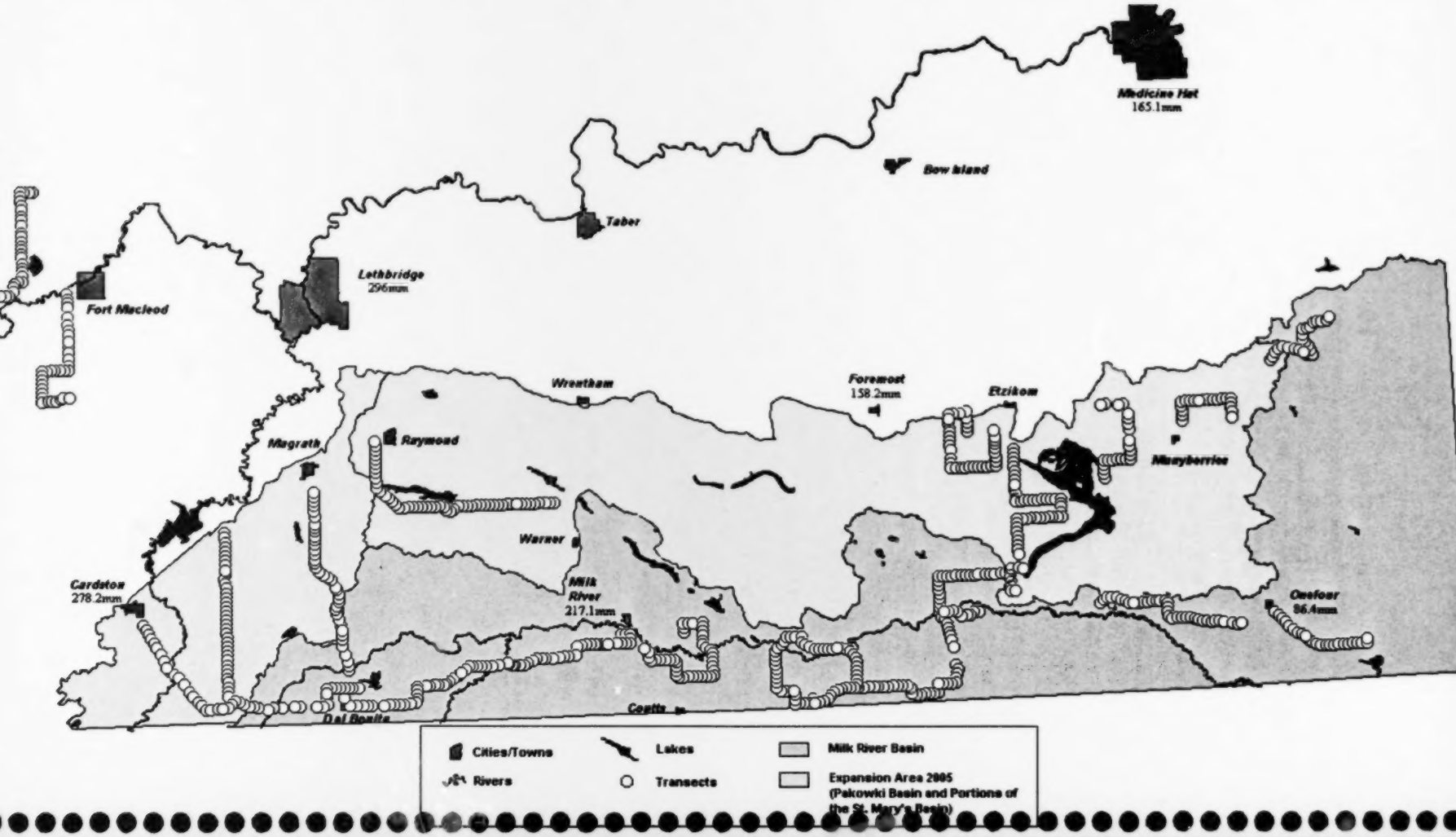
Kendall, K. 2002. Survey protocol for the northern leopard frog. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 43, Edmonton, AB. 30 pp.

Taylor, B. and B. Downey. 2002. Amphibians Surveys of the Milk River Basin. Pages 93-103 in Quinlan, R. W., B. A. Downey, B. N. Taylor, P.F. Jones, and T.B. Clayton (eds.). A multi-species conservation strategy for species at risk in the Milk River Basin: Year 1 progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 72, Edmonton, AB.

Wershler, C. and W. Smith. 1992. Status of the Great Plains Toad in Alberta- 1990. World Wildlife Fund Canada (Prairie for Tomorrow) / Alberta Forestry Lands and Wildlife. 232pp

Appendix C

2005 Toad Transects and Precipitation Amounts (May 1- July 31) within the MULTISAR program area, Alberta.
***Precipitation data from Environment Canada**



CHAPTER 4

FISHERIES

Fisheries Investigations in the Lower Milk River, Alberta, in 2005

Christy Sikina and **Terry Clayton,** Alberta Sustainable Resource Development, Fish and Wildlife Division, Lethbridge, Alberta

1.0 INTRODUCTION

Studies began in 2000 to investigate the status of some fish species that were thought not to be abundant and potentially declining in the Milk River, Alberta. The species of concern were the western silvery minnow (*Hybognathus argyritis*), St. Mary sculpin (provisionally *Cottus bairdi punctulatus*), stonecat (*Noturus flavus*), brassy minnow (*Hybognathus hankinsoni*), and sauger (*Sander canadensis*). For the western silvery minnow and stonecat, their only know ranges in Alberta are in the Milk River, which is unique in the province since it is the only river system that is part of the Missouri drainage. Prior to 2000 there had been some fisheries studies, but they primarily focused on species found around potential dam sites and on species of sport-fishing value.

Investigations of fish species in the Milk River since 2000 have focused on specific aspects of the fish fauna. In 2000 and 2001, the studies were primarily on the overall fish community dynamics in specific seasons. In 2002, studies were more directed to areas of the river with data gaps. This was primarily due to the geographical setting of the basin. In the lower reach of the river below the last bridge crossing (Hwy 880), access is limited to two ranch sites, and as such, most access has to be by helicopter. The focus of the 2003 and 2004 studies was on fish refugia in tributaries to the mainstem Milk.

In 2001, the western silvery minnow was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "Threatened". The listing of "Threatened" by the Federal Government led to the formation of a western silvery minnow recovery team, which by agreement of team members evolved into a Milk River Species Fish Recovery Team (MRSFRT). By spring 2005, the MRFSRT had completed an initial draft of Recovery Strategy and Action Plan for the western silvery minnow. The Action Plan indicated specific investigations that needed to be completed to answer questions on the life history and habitat usage for this species.

2.0 METHODS

The field season on the Milk River was scheduled from late May thru to August and the fall of 2005. Due to inclement weather (flooding) sampling did not commence until 14 June 2005. Summer sampling was completed on 25 August 2005 and fall sampling occurred from 29 September to 17 November 2005. Fall sampling commenced after shut down of the St. Mary diversion canal and discharge in the mainstem Milk River reached normal fall levels of approximately 2.0m^3/s.

Twelve sites (Appendix D) on the Milk River were accessed throughout the field season and all sites were located downstream of the Writing on Stone rodeo grounds. Site access occurred via 4-wheel drive truck and hiking. Most sites were visited on a bi-weekly basis,

and all sites were visited at least twice throughout the field season. Photos were taken at each site using a Minolta *D*image S404 digital camera to document western silvery minnow habitat (Appendix E) as well as habitat changes throughout the season. All site/sample locations (UTM) were recorded using a Garmin Etrex Global Positioning System (GPS) receiver. Hobo brand temperature loggers were placed in the Milk River at the Deer Creek Bridge (Site 3) and the Pinhorn Ranch (Site 11) to record water temperature hourly throughout the field season. Alberta Environment provided water temperature data for the Milk River at the Aden Bridge (Site 7). Water Survey of Canada provided preliminary discharge data for the Milk River at the Town of Milk River (Water Survey of Canada Station 11AA005) and the Eastern Border Crossing (Water Survey of Canada Station 11AA031).

A two-person crew conducted fish sampling. Sampling gear utilized throughout the field season included an Ace Mesh beach seine (5.9m long X 1.5m high), commercially available Gee minnow traps and crayfish traps; two custom metal and wire mesh minnow traps, drift nets, small mesh dip nets and setlines. A Smith-Root Type VII backpack electrofisher also was employed once during fall sampling.

Drift nets were set at five of the access sites from 14 June thru to 8 July 2005. Nets were set to capture fish eggs drifting in the water column. For each net set, location and velocity (m/s) were recorded. Flow measurements were taken directly upstream of the drift net funnel using a Marsh McBirney flow meter. All eggs collected (n= 6) were preserved in whirl-packs containing 5% formalin and sent to the Department of Fisheries and Oceans (DFO) in Winnipeg, Manitoba for identification.

Beach seining was completed at all the 2005 access sites. Three to eight seine hauls were conducted at each site and most hauls were 30m long. Each haul was measured and flagged prior to seining. At this time, the upstream and downstream locations were also recorded. Samplers then deployed the seine across the sample area, and moved downstream at a rapid and constant pace (P&E Environmental 2002). At the downstream end of the site, the seine was turned into shore (P&E Environmental 2002). If the led line of the seine snagged on the bottom during the haul, the haul was abandoned. Fish were sampled at the end of each haul.

During the summer, minnow traps were set each afternoon at whichever site was to be seined the following day. Traps were left to fish overnight, emptied the next morning and then re-set to fish during the day while seining was completed. At the end of the day, traps were retrieved and relocated to the next site. Fish were sampled as each trap was pulled. Location of each trap was recorded along with the time the trap was set and lifted.

All fish collected were enumerated and almost all were measured for fork length (FL) and/or total length (TL) in millimeters (mm). Sub-samples of lake chub (*Couesius plumbeus*), flathead chub (*Platygobio gracilis*) and suckers (*Catostomus catostomus*, *Catostomus commersoni* and *Catostomus platyrhynchus)* were measured if more than 30 of that particular species were caught in a single haul. For fish 50 mm and smaller only total length was recorded. Weights (to the nearest gram) were recorded for larger fish and

when weather conditions (wind) did not affect the scale. Most fish were returned to the river after sampling; however, some representative samples were preserved in whirl-packs containing 10% formalin. Samples were returned to the lab and identified with the aid of a binocular microscope, using the keys provided in Nelson and Paetz (1992) and Scott and Crossman (1973). Some specimens were sent to the Freshwater Institute in Winnipeg, Manitoba to confirm identification.

Catch per unit effort for beach seining is reported based on the catch, by species for 100 m^2. Area was calculated by multiplying total distance (length) seined by an effective seining width of 2.95 m (half the width of the seine). For the minnow traps, catch per unit effort was calculated as the number of fish, by species, caught per trap per 24 hours. Electrofishing catch per unit effort is reported as the number of fish per minute. The relative abundance of eggs captured in drift nets is reported as number of eggs per hour.

All data was initially recorded in a field notebook and then transferred into Microsoft Excel spreadsheet format. These are stored in the provincial Fisheries Management Information System (FMIS) database.

3.0 RESULTS

3.1 Fish Species Composition

A total of 3055 fish, comprising 17 species, were caught in the Milk River during the 2005 field season (Table 4.1). Western silvery minnow (n=88), the target species in 2005, comprised 2.9% of the total catch. Other species of interest, including stonecat (n=40), St. Mary sculpin (n=1), brassy minnow (n=4), and sauger (n=1) were also captured.

Flathead chub (37.2%) and lake chub (36.2%) dominated the total catch followed by sucker species (all species combined), which accounted for 17.2% of the catch. Longnose dace (*Rhinichthys cataractae*) comprised 3.9% of the catch and combined, brook stickleback (*Culaea inconstans*), burbot (*Lota lota*), fathead minnow (*Pimephales promelas*), Iowa darter (*Etheostoma exile*), northern pike (*Esox lucius*), and trout-perch (*Percopsis omiscomaycus*), comprised less than 1.5% of the total catch.

Table 4.1: Seasonal composition of fish species caught from the Milk River, 2005.

Species	Summer	Fall	Total	% of Total Catch
Brassy minnow	4	0	4	0.1
Brook stickleback	12	0	12	0.4
Burbot	1	0	1	0.03
Flathead chub	926	210	1136	37.2
Fathead minnow	10	6	16	0.5
Iowa darter	1	0	1	0.03
Lake chub	1080	26	1106	36.2
Longnose dace	91	29	120	3.9
Longnose sucker	280	19	299	9.8
Mountain sucker	66	5	71	2.3
Northern pike	2	0	2	0.1
Stonecat	38	2	40	1.3

Sauger	1	0	1	0.03
St. Mary sculpin	0	1	1	0.03
Trout-perch	2	0	2	0.1
White sucker	45	9	54	1.8
Western silvery minnow	50	38	88	2.9
Unidentified sucker spp.	87	14	101	3.3
Total	**2696**	**359**	**3055**	**100.0**

3.2 Fish Species Distribution

Western silvery minnow were caught at least once from every site sampled below the Aden Bridge and were caught as far upstream as Writing on Stone Provincial Park (Figure 4.1). In addition, western silvery minnow were captured consistently throughout the summer at the Ross Ranch/Bear Creek site. They were also captured within the Milk River Natural Area both times it was sampled. Stonecats were captured upstream and downstream of the Aden Bridge (Figure 4.2). Over half (n=25) of the stonecats were captured during the month of August and of the total stonecats caught, 20% were caught at the Deer Creek Bridge and 32.5 % at the Pinhorn Ranch.

Among the non-species at risk, flathead chub, lake chub and the sucker species were captured at every site throughout the study area. Iowa darter, sauger and northern pike were only captured downstream of Aden Bridge and all other species were captured at least once above and below the Aden Bridge.

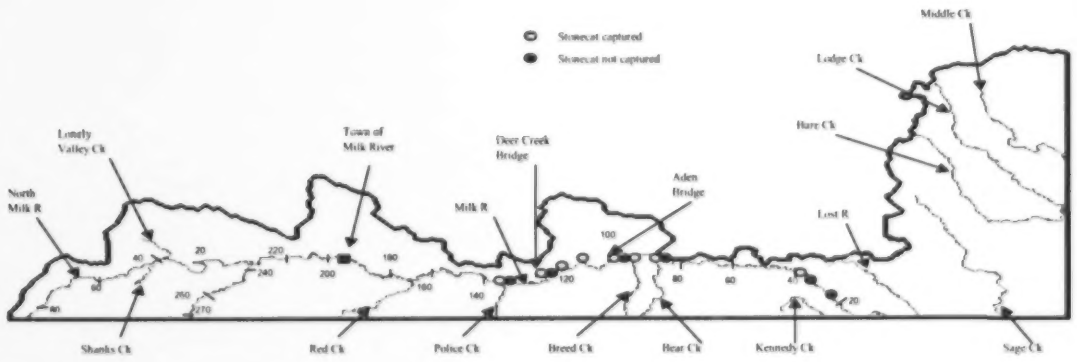


Figure 4.2: Distribution of stonecat captured in the Milk River, 2005.

3.3 Relative Abundance

Capture rates by beach seining during the summer were 18.4 fish/100m^2 and in the fall were 8.4 fish/100m^2 (Table 4.2). The catch per unit effort for western silvery minnow was greater in the fall (0.9 fish/100m^2) than in the summer (0.4 fish/100m^2) (Table 4.2). Stonecats were never caught with the beach seine (Table 4.2). During the summer lake chub (8.6 fish/100m^2) was the most abundant species captured followed by flathead chub (4.3 fish/100m^2) while in the fall, the converse of this occurred (Table 4.2). The total catch per unit effort for sucker species was 3.3 fish/100m^2 (Table 4.2). Catch per unit effort for the all other species was less than 1.0 fish/100m^2 (Table 4.2).

Table 4.2: Seasonal catch per unit effort (# fish/100 m^2) for fish species caught by beach seining in the Milk River, 2005.

Species	Summer	Fall	Total
Effort	11 582 m^2	4151 m^2	15 732 m^2
Brassy minnow	0.03	0.00	0.03
Brook stickleback	0.1	0.0	0.1
Burbot	0.0	0.0	0.0
Flathead chub	4.3	5.0	4.5
Fathead minnow	0.1	0.1	0.1
Iowa darter	0.01	0.00	0.01
Lake chub	8.6	0.6	6.5
Longnose dace	0.8	0.6	0.7
Longnose sucker	2.4	0.4	1.9
Mountain sucker	0.6	0.1	0.5
Northern pike	0.02	0.00	0.01
Stonecat	0.0	0.0	0.0
Sauger	0.01	0.00	0.01
St. Mary sculpin	0.0	0.0	0.0
Trout-perch	0.02	0.00	0.01
White sucker	0.4	0.2	0.3
Western silvery minnow	0.4	0.9	0.6
Unidentified sucker spp.	0.8	0.3	0.6
Total	18.4	8.4	15.7

In total 341 minnow traps were set (136 day and 205 night) to fish during the field season. Western silvery minnow were not caught in the minnow traps during the 2005 season (Table 4.3). A total of 38 stonecats, 1 in the day traps and 37 in night traps, were captured, yielding 0.04 and 0.1 stonecat/trap/24 hours, respectively (Table 4.3). Flathead chub (6.9 fish/trap/24 hours) and lake chub (1.4 fish/ trap/24 hours) were captured more frequently during the day (Table 4.3). Catch per unit effort for each of the following species, brassy minnow, brook stickleback, burbot, fathead minnow and longnose sucker, was 0.003 fish/trap/24 hours at night (Table 4.3). Each of these species was only caught once.

Table 4.3: Diurnal catch per unit effort (# fish/trap/24 hours) for fish caught in minnow traps in the Milk River, 2005.

Species	***Day Traps (# fish/trap/24hrs.)	**Night Traps (# fish/trap/24hrs.)	*Total Traps (# fish/trap/24hrs.)
Brassy minnow	0.0	0.003	0.002
Brook stickleback	0.0	0.003	0.002
Burbot	0.0	0.003	0.002
Flathead chub	6.9	0.8	0.7
Fathead minnow	0.0	0.003	0.0
Iowa darter	0.0	0.0	0.0
Lake chub	1.4	0.2	0.1
Longnose dace	0.1	0.0	0.003
Longnose sucker	0.1	0.0	0.005
Mountain sucker	0.0	0.0	0.0
Northern pike	0.0	0.0	0.0
Stonecat	0.04	0.1	0.1
Sauger	0.0	0.0	0.0
St. Mary's sculpin	0.0	0.0	0.0
Trout-perch	0.0	0.0	0.0
White sucker	0.0	0.0	0.0
Western silvery minnow	0.0	0.0	0.0
Unidentified sucker spp.	0.0	0.0	0.0
Total	8.4	1.1	0.9

***Day traps fished for an average of 3.2 hours
** Night traps fished for an average of 19.6 hours
* Total traps fished for an average of 13.1 hours

The relative abundance of eggs captured was low, yielding 0.01 eggs/net/hour (Table 4.4). Six eggs, not currently identified, were captured in drift nets from the Milk River in 2005. Eggs were collected at the Aden Bridge, just upstream of the Bear Creek Confluence and at the Pinhorn Ranch (Table 4.3). At sites where eggs were collected, the water velocity recorded ranged from 0.40 to 0.66 m/s (Table 4.4).

Table 4.4: Catch per unit effort (# eggs/net/hour) for fish eggs caught in drift nets from the Milk River, 2005.

Date	Easting	Northing	Location	# Eggs/Net/Hr.	Velocity (m/s)
14-Jun	460795	5437358	Site 3	0.000	0.43
14-Jun	460761	5437340	Site 3	0.000	0.65
15-Jun	477587	5443669	Site 7	0.000	0.69
15-Jun	477576	5443674	Site 7	0.004	0.66
16-Jun	508215	5441948	Site 11	0.000	0.60
16-Jun	508206	5441926	Site 11	0.000	0.58
16-Jun	508210	5441923	Site 11	0.000	
17-Jun	462308	5437684	Site 4	0.000	0.45
17-Jun	462299	5437677	Site 4	0.000	0.18
21-Jun	509276	5441239	Site 11	0.002	0.60
21-Jun	509316	5441248	Site 11	0.002	0.64
21-Jun	509341	5441249	Site 11	0.000	0.63
22-Jun	485058	5444223	Site 10	0.000	0.24

22-Jun	485036	5444253	Site 10	0.002	0.46
22-Jun	484990	5444264	Site 10	0.000	0.62
23-Jun	477590	5443672	Site 8	0.000	0.50
23-Jun	477590	5443654	Site 8	0.000	0.54
28-Jun	462291	5437668	Site 4	0.000	0.60
29-Jun	477570	5443659	Site 7	0.000	0.58
30-Jun	460795	5437358	Site 3	0.000	0.50
30-Jun	460761	5437340	Site 3	0.000	0.45
6-Jul	509776	5441866	Site 11	0.000	0.49
6-Jul	509759	5441832	Site 11	0.002	0.40
7-Jul	485080	5444253	Site 10	0.000	0.43
7-Jul	485062	5444285	Site 10	0.000	0.57
8-Jul	454984	5436624	Site 2	0.000	0.45
Total				0.01	

On the 17 November 2005, a single electrofishing pass (effort 18.7 min.) was conducted at the Aden Bridge site. The overall catch per unit effort was 0.4 fish/min and was comprised of three longnose dace (0.2 fish/min), two stonecat (0.1 fish/min), one flathead chub (0.05 fish/min) and one St. Mary sculpin (0.05 fish/min). No other species were captured or observed at this time.

3.4 Life History Characteristics

Western silvery minnow captured in 2005 ranged in total length from 42 mm to 129 mm with a mean total length of 82.5 mm (Figure 4.3). Most length categories were well represented; however, no fish in the 85mm to 90mm range were collected.

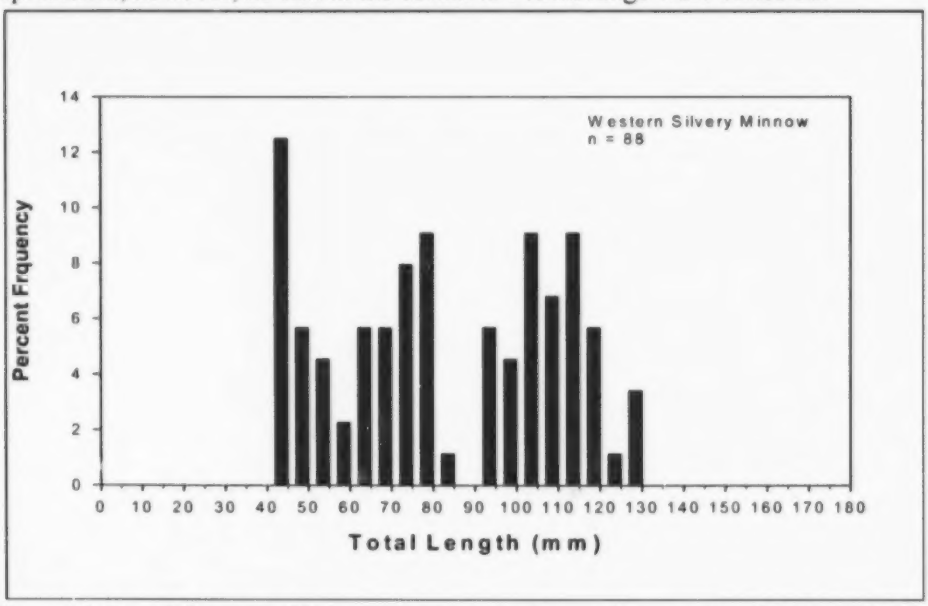


Figure 4.3: Length frequency histogram for western silvery minnow captured in the Milk River, 2005.

Total length for all western silvery minnow captured during the month of October, from years 2000 to 2005, ranged from 32mm to 154 mm with a mean of 92mm (Figure 4.4). During this period, there were 133 western silvery minnow with both fork length and total length data. The regression equation of fork length to total length was calculated to be: TL = -0.016071 + 1.1026756 FL, $R^2 = 0.994326$. This equation was used to estimate total length for 59 western silvery minnow that had only fork length data.

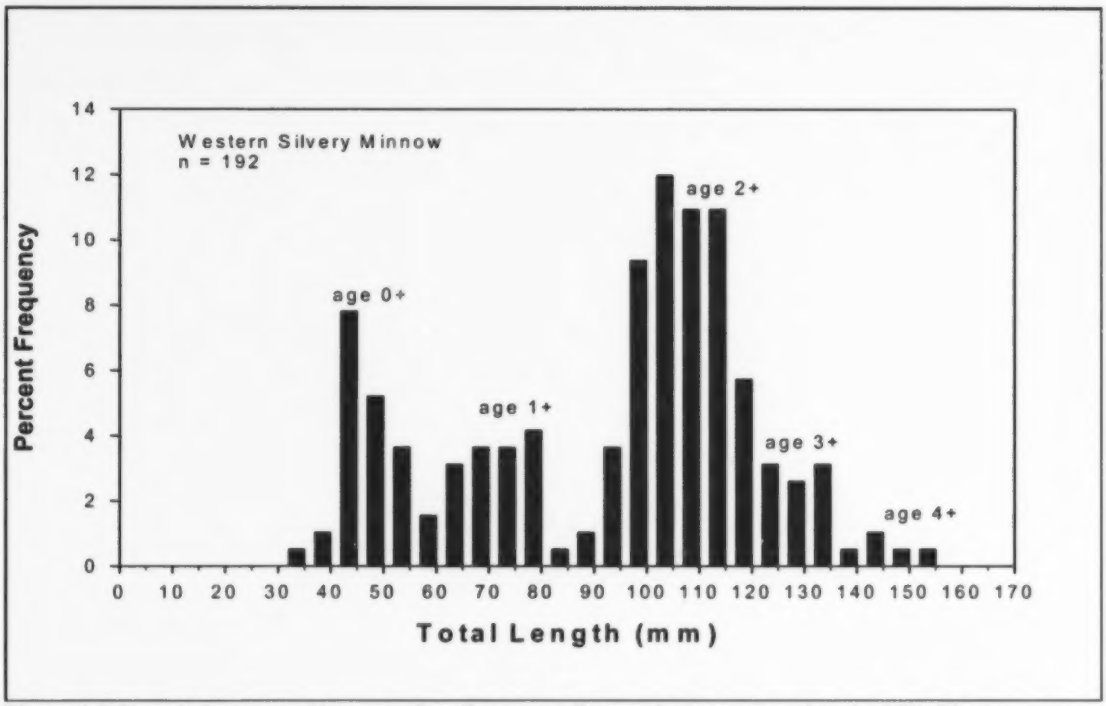


Figure 4.4: Length-frequency histogram for all western silvery minnow captured in the Milk River during the month of October 2000, 2001, 2002 and 2005. Ages based on scales and length frequency histograms.

Three western silvery minnow collected from the Bear Creek confluence (12U 0485052E 544223N) on 22 June 2005 were examined internally to determine sex and maturity. All three minnows were females with eggs, indicating that not all minnow spawning had been completed by that date. Biological data for these fish are presented in Table 4.5 and a picture (#5) of the site is presented in Appendix 2.

Table 4. 5: Biological data of western silvery minnow examined internally, from Bear Creek Confluence 22 June 2005.

Western silvery minnow	Fork Length (mm)	Total Length (mm)	Weight (g)	Weight of Ovaries (g)	# Of Eggs
1	115	129	19.7	4.6	2026
2	101	114	13.2	1.2	1538
3	91	109	11.3	1	1006

Stonecat had a mean total length of 155.7 mm and ranged from 70 mm to 247 mm (Figure 4.5). Most total length categories were represented except the 71mm to 80 mm category and the 211mm to 220mm category (Figure 4.5).

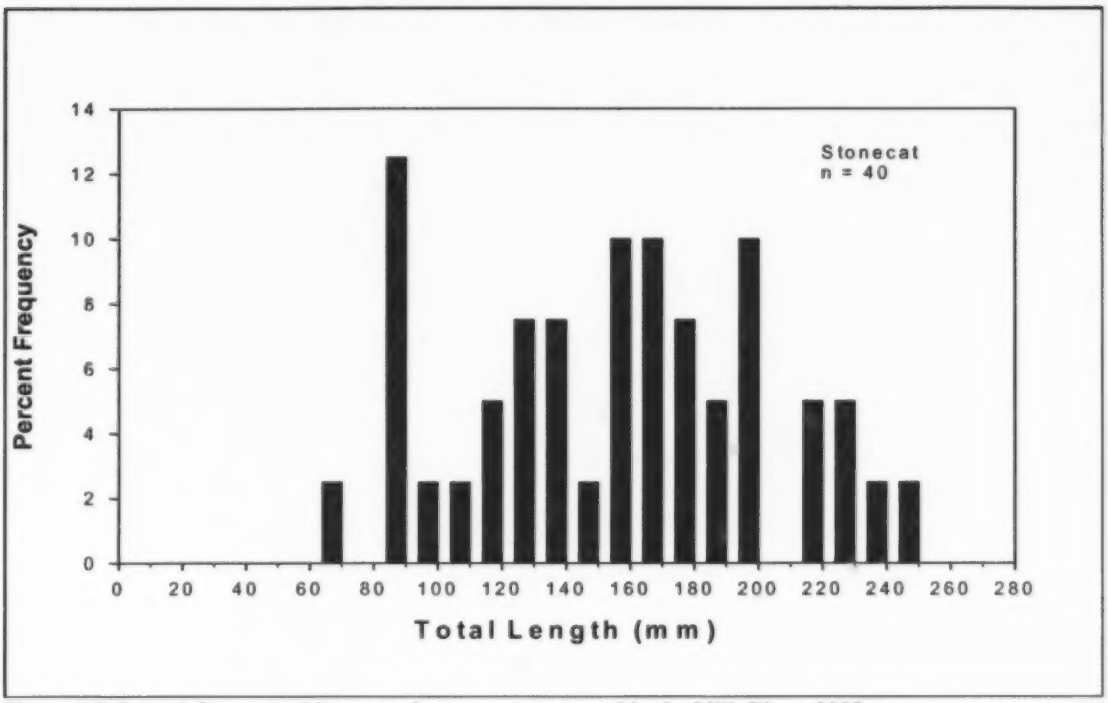


Figure 4.5: Length frequency histogram for stonecat captured in the Milk River, 2005.

3.5 Habitat Characteristics

In 2005, all western silvery minnow were captured in sections of the river where they had depth and turbidity for cover. During both summer and fall sampling, they were captured most frequently along mid-channel sand bars from the middle to the downstream portion of the sandbar. During summer sampling, they were also captured along the shoreline generally just downstream of an inside meander bend; however, this never occurred during fall sampling. Three western silvery minnow were captured in the mouth of Bear Creek (Ross Ranch) and occasionally they were caught behind point bars. Sand substrate was also a common feature at the sites where western silvery minnow were captured. No spawning or rearing habitat was identified during the 2005 sampling. Habitat photos where western silvery minnow were captured are provided in Appendix E.
During the fall, habitat where western silvery minnow were found to be schooling in previous falls was examined on a regular basis; however, no large schools of western silvery minnow were located in 2005.

Habitats used by stonecat varied between the areas sampled. Stonecats caught near Police Creek and at the Deer Creek Bridge were collected in shallow water with gravel substrate. Upon release from minnow traps, stonecats were observed taking cover

under/near cobble just downstream of the Deer Creek confluence. At the Pinhorn Ranch, they were caught in a deep pool (greater than 1m deep), on the outside of a meander bend. The substrate at this location was silt.

Mean daily water temperatures were fairly similar at all three recording locations; however, there was a warming of approximately 0.5 °C to 1.5 °C as the water moved downstream (Figure 4.6) from the Deer Creek Bridge to the Pinhorn Ranch (Figure 4.6) Water temperature peaked on 13 July 2005 at all three locations: Deer Creek Bridge (24.4 °C), Aden Bridge (26.8 °C) and the Pinhorn Ranch (26.8 °C) (Figure 4.6). On 8-9 June 2005, mean daily water temperature of the Milk River dropped approximately 5 °C below the monthly average of 16.4 °C due to a heavy rainfall event (Figure 4.6). Figure 4.7 illustrates maximum and minimum daily temperature for all three locations.

Maximum discharge for the Milk River, recorded at the town of Milk River was 63.1 m^3/s on 8 June 2005 and 68.5 m^3/s at the Eastern Border Crossing on 10 June 2005 (Figure 8). An average discharge of 17.8m^3/s and 18.1 m^3/s occurred at the Town of Milk River for the months of July and August, respectively. Discharge at the Eastern Border Crossing was slightly less and averaged 16.1 m^3/s and 16.5 m^3/s for July and August, respectively. Water diversion from the St. Mary's Canal into the North Milk River was discontinued in mid September 2005 and average flows receded. During October, flow in the Milk River averaged 1.95 m^3/s at the town of Milk River and 2.29 m^3/s at the Eastern Border Crossing (Figure 4.8).

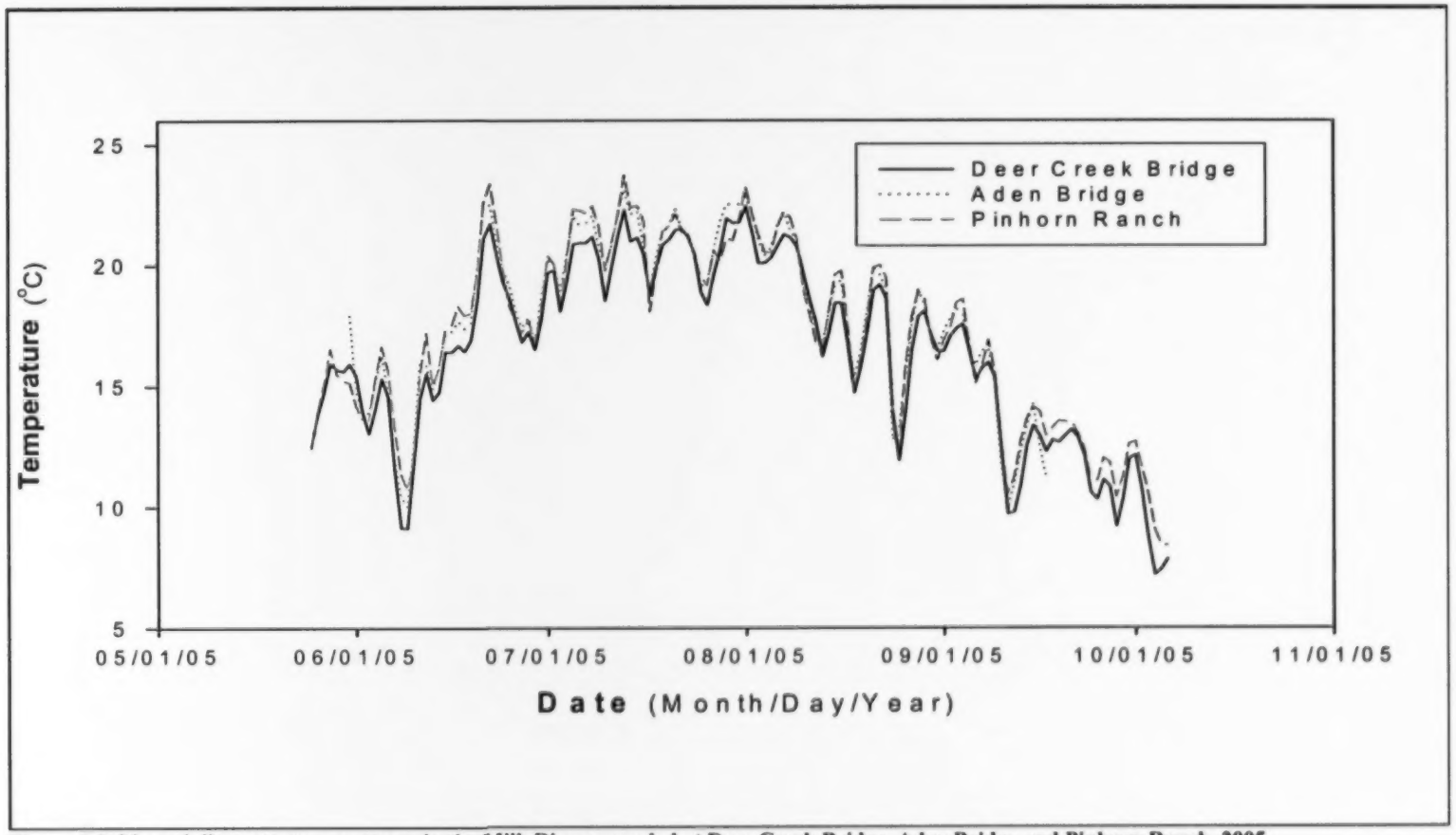


Figure 4.6: Mean daily water temperatures in the Milk River recorded at Deer Creek Bridge, Aden Bridge and Pinhorn Ranch, 2005.

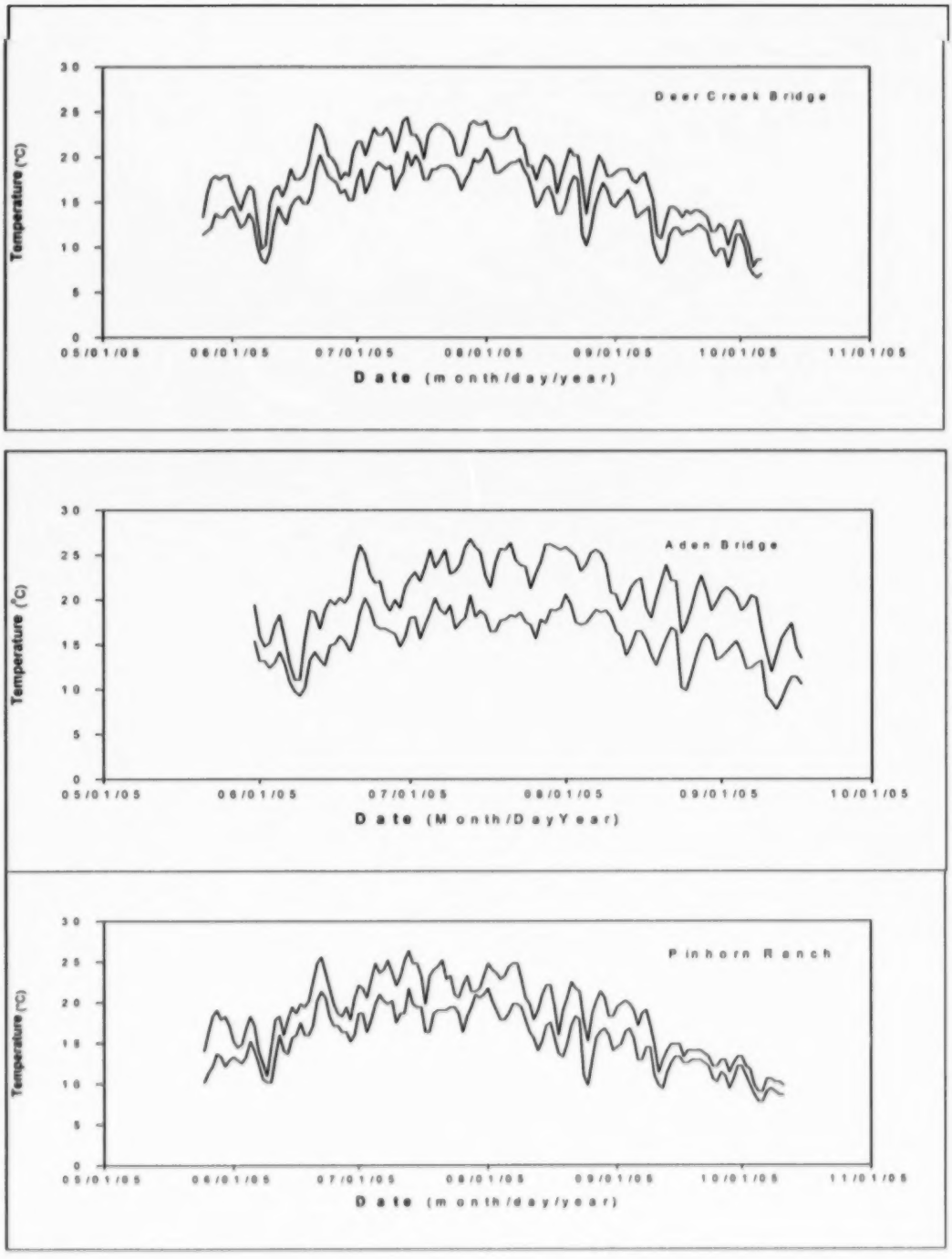


Figure 4.7: Daily minimum and maximum water temperatures in the Milk River, 2005.

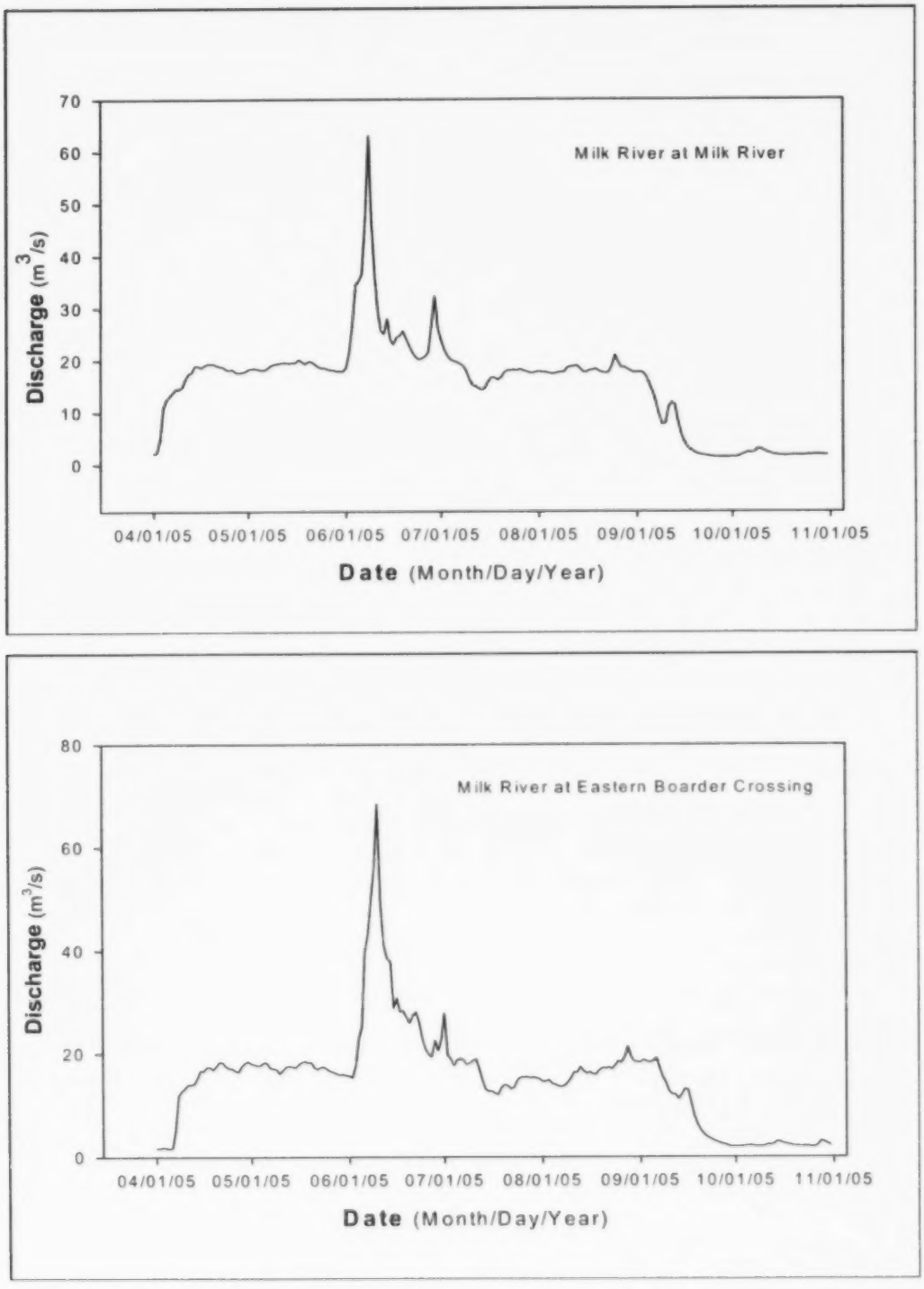


Figure 4.8: Preliminary mean daily discharge for the Milk River at the Town of Milk River and at the Eastern Border Crossing, recorded from 1 April to 31 October 2005.

4.0 DISCUSSION

The fisheries component of the 2005 MULTISAR Program focused primarily on obtaining biological/life history information and habitat requirements for the western silvery minnow. Data collected in 2005 were compared to data collected in 1979, 2000, 2001 and 2002 (Clayton and Ash 1980, P&E Environmental 2002, RL&L 2002) and recent data (2005) collected by DFO. Sites sampled by Clayton and Ash in 1979 and by RL&L in 2000 and 2001 were similar to sites sampled in 2005. In 2002, P&E Environmental sampled from the Pinhorn Ranch downstream to the international border. DFO sampled the Milk River from the Aden Bridge across the border into the United States in July 2005 (D. Watkinson, Fisheries and Oceans Canada, Winnipeg, MB, pers.comm.).

4.1 Species Composition Comparison

In comparison, species composition from 2005 was similar to species composition documented in 2000 and 2001 (RL&L 2002). Seventeen species of fish were captured in the Milk River in 2005 whereas in 2000 and 2001 only fourteen species of fish were documented. Species captured in 2005 and not in 2000/2001 were fathead minnow, Iowa darter and brook stickleback. P&E Environmental encountered ten fish species during the 2002 fall survey of the lower Milk River. Flathead chub, lake chub, longnose dace and sucker species were common in 2005 as well as in previous studies (P&E Environmental 2002, RL&L 2002).

Since the recent studies began in 2000, western silvery minnow comprised slightly more of the fall catches than the summer catches. In 2005, western silvery minnow comprised 1.9% of the total summer catch and 10.6% of the total fall catch. In 2000, they were only caught in the fall and comprised 0.1 % of the catch (RL&L 2002). In 2001, there was little difference in seasonal species composition as western silvery minnow accounted for 0.4% of the summer catch and 0.5% of the fall catch. During the fall of 2002, P&E Environmental encountered 63 western silvery minnow comprising 43.7% of the total catch.

Stonecats were captured during summer (1.4% of total) and fall (0.6% of total) sampling in 2005; however, in 2001 and 2000 they were only captured in the fall and comprised 1.5% and 0.4% of the total catch, respectively. P&E Environmental (2002) also encountered stonecat during the 2002 fall sampling.

4.2 Species Distribution Comparison

According to previous documentation, distribution of western silvery minnow in Canada appears to be limited to the lower section of the Milk River mainstem, from Police Creek to the United States border (approximately 140 km) (Clayton and Ash 1980, Nelson and Paetz1992, RL&L 2002, ASRD 2003). In the present study, western silvery minnow were captured in the Milk River from Writing on Stone Provincial Park downstream to the

Milk River Natural Area and DFO captured western silvery minnow from just downstream of the Aden Bridge into the United States. Among the 528 western silvery minnow caught by DFO, 316 were caught in Canada and 212 in the United States, (D. Watkinson, pers.comm.). Although, DFO first encountered western silvery minnow just downstream of the Aden Bridge, larger schools (40+) of western silvery minnow were not observed until the Pinhorn Ranch area and the largest school (n=158) of western silvery minnow encountered was in the United States (N 48.99577 W110.52757) (D.Watkinson, pers.comm.) In addition, substantially fewer sites were sampled in the United States (n=4) versus Canada (almost every km for 96 km) (D.Watkinson, pers. comm.).

In October 2004, a school (approximately 150) of western silvery minnow was observed in a side channel just downstream of the Deer Creek Bridge and another 12 were captured at the Deer Creek Confluence. Clayton and Ash (1980) also documented silvery minnow near the Deer Creek Bridge in their 1979 fall and winter study. No schools of western silvery minnow were located at these sites in fall 2005.

In Canada, the stonecat is limited to the southern most drainages in Quebec, Ontario, Manitoba, Saskatchewan and Alberta, and in Alberta, the only confirmed occurrence of the stonecat has been in the Milk River system (ASRD 2004). Stonecats have been documented in the mid and lower sections of the Milk River mainstem and in the lower North Milk River (Willock 1969, RL&L 2002). In the present study, stonecats were captured from upstream of Police Creek to the Pinhorn Ranch. No stonecats were caught in Milk River Natural Area. This may be a result of insufficient sampling effort and methods utilized. The most common method for collecting stonecat in 2005 was minnow traps and traps were only set once in the Natural Area.

In Alberta, distribution of the St. Mary sculpin is limited to Lee Creek, the St. Mary River above the St. Mary Reservoir, the North Milk River and the Milk River mainstem, except for the lowermost section (0-85km upstream of the international border (RL&L 2002, ASRD 2004). Although the St. Mary scuplin has been previously documented within the Aden Bridge/ Ross Ranch area, the abundance caught in this reach is extremely low (RL&L 1987, RL&L 2002). Conversely, this species is common/ locally abundant upstream of Writing on Stone Provincial Park (Paetz 1993, ASRD 2004). Additionally, the sculpin appears to have a preference for cooler water temperatures and clean rocky substrates (Paetz 1993, ASRD 2004) and this habitat is present in the upper Milk and North Milk rivers. Thus, the single St. Mary sculpin caught at the Aden Bridge, where the substrate is mainly sand, can be considered a rare occurrence.

4.3 Relative Abundance Comparison

The overall (all species combined) summer beach seining catch per unit effort from the present study is comparable with the 2000 data from RL&L but not the 2001 data (RL&L 2002). The overall catch per unit effort during the summer sampling was 18.4 fish/100 m^2 in 2005 and 19 fish/100 m^2 in 2000, while in 2001 the summer catch per unit effort was 35 fish/100 m^2. During the 2005 fall sampling, the catch per unit effort was substantially

lower than in 2000, 2001 (RL&L 2002) but greater than in 2002 (P&E 2002). Fall catch per unit effort for 2005 yielded 8.4 fish/100 m^2 where as 42 fish/100m^2 and 439 fish/100m^2 were caught in 2000 and 2001, respectively. P&E (2002) reported a beach seining catch rate of 0.3 fish/100 m^2 during the fall of 2002.

In the Milk River, relative abundance of western silvery minnow appears to be higher in fall than summer. Relative abundance values for western silvery minnow captured beach seining in 2005 were 0.4 fish/100m^2 during the summer and 0.9 fish/100m^2 during the fall. In comparison, during summer of 2000 western silvery minnow were not captured beach seining and in the summer of 2001, the catch per unit effort was 0.1 western silvery minnow/100m^2 (RL&L 2002). During the fall of 2000, 0.06 western silvery minnow/100 m^2 were captured and in 2001 beach seining yielded 3.0 western silvery minnow/100 m^2 (RL&L 2002). In the fall of 2002, P&E Environmental captured 0.6 western silvery minnow/100m^2. Yu and Peters (2003) also found western silvery minnow to be more abundant in the fall in the Platte River (Nebraska) and that the seasonal distribution suggests a temporal distribution for western silvery minnow.

No stonecats were captured with the beach seine in 2005. This was consistent with previous data results by RL&L (2002) and P&E Environmental (2002).

As this was the first study since 2000 to employ minnow traps, no comparable data sets were available. In the present study, western silvery minnow were not captured in minnow traps. A study in Nebraska captured significantly more western silvery sampling during the night than the day; however, the sampling technique utilized (i.e. shore-based electrofishing) was different (Yu and Peters 2003).

The majority of stonecats were captured via minnow traps. Minnow traps yielded 0.04 stonecat/trap/24 hours in the day traps and 0.1 stonecat/trap/24 hours in the night traps. This is most likely due to the nocturnal feeding habits of the stonecat.

The single electrofishing pass in the fall of 2005 yielded 0.4 fish/ min., (all species combined) which is less than the relative abundance values for the fall of 2000 (6.1 fish/min) and 2001 (10.7 fish/min) (RL&L 2002). In 2005 and 2000 (RL&L 2002) western silvery minnow were not captured electrofishing and in 2001, the abundance of western silvery minnow caught electrofishing was low (0.01 fish/min) (RL&L 2002). Stonecats were captured via electrofishing at or just upstream of the Aden Bridge in 2005, 2001 and 2000 (RL&L 2002) and had comparable relative abundance values of 0.1 stonecat/min 0.2 stonecat/min., and 0.2 stonecat/ min., respectively.

4.4 Life History Characteristics

In 2005, captured western silvery minnow had a mean fork length 74.4 mm (mean total length of 82.5 mm) compared to mean fork length of 41mm in 2000, mean fork length of 97 mm in 2001 (RL&L 2002) and 88.3 mm mean fork length in 2002 (P&E 2002).

Describing western silvery minnow length-at-age, via scales (non lethal sampling) was one of the objectives outlined in the recovery plan. A length frequency histogram was constructed for all western silvery minnow captured during the fall (October) from 2000 to 2005, to determine length at the end of the growing season (Figure 4). The intervals 41-45mm, 76-80mm and 100-105mm suggested that these were the average lengths that fish aged zero to two attained by the end of the growing season.

DFO conducted stomach content analysis on western silvery minnow captured in July 2005. They were able to confirm that diet consisted of green algae, blue-green algae, diatoms and zooplankton (D. Watkinson, pers.comm.), which has been speculative until now.

Presently, there is no information on the reproductive strategy utilized by the western silvery minnow. Speculation on the reproductive strategy and spawning habitat for this species is derived from information on the reproductive strategies of other cyprinids from the *Hybognathus* genus in North America. The Rio Grande silvery minnow (*Hybognathus amarus*) and the plains minnow (*Hybognathus placitus*) are both pelagic-broadcast spawners (no apparent substrate preference) that produce nonadhesive, semibuoyant eggs (Platania and Altenbach 1998) and require significant stretches of connected habitat with turbid sediment laden flowing water of moderate velocity (Platania and Altenbach 1998, Cowley 2002, Pollard 2005). This reproductive strategy and egg type also appear to be common in other Plains stream cyprinids in the west-central United States (Altenbach *et al* 2000). It has been suggested that western silvery minnow utilize this strategy (Pollard 2005). Lithopelagophils, on the other hand, are rock and gravel spawners with pelagic free embryos (Simon 1999). In this strategy, embryos initially have an adhesive chorion but soon become buoyant (Simon 1999). The central silvery minnow (*Hybognathus nuchalis*), whose distribution is similar to the western silvery minnow in the United States, utilizes this reproductive strategy. Conversely, Raney (1939) reported that the eastern silvery minnow (*Hybognathus regius*) laid non-adhesive demersal eggs (eggs that sink) on the muddy bottoms of quiet areas (ASRD 2003). Raney (1939) also reported that adult eastern silvery minnow migrated into well-vegetated lagoons or slow moving lower reaches of tributary streams to spawn in April and May when water temperature was between 13 and 22 ºC.

Since pelagophils and lithopelagophils both have buoyant eggs that drift in the water column, drift nets were set in the Milk River in an attempt to capture eggs. Sampling in 2005 did not commence until mid June and the few eggs collected in this study may be a result of not sampling at night, not sampling during the right week or sampling during above average discharge in the spring. Watkinson (pers. comm.) observed eggs in some females caught in early July 2005. In addition, the historical (1909 to 2004) mean daily discharge for the Milk River at Milk River is 13.8 m^3/s, 17.9 m^3/s and 19.4 m^3/s for April, May and June respectively (Water Survey of Canada). In 2005 the mean daily discharge for the respective months was 15.7 m^3/s, 18.8 m^3/s and 28.4 m^3/s (Water Survey of Canada). This flow may have displaced eggs downstream more quickly than in previous years and contributed to the low catch rate. Mean water temperature in the Milk River during the month of May 2005 was 14.8 ºC, which is within the temperature range reported when spawning of other *Hybognathus* species has been observed. In future years

sampling for western silvery minnow eggs should commence earlier in the season and continue well into July.

Scott and Crossman (1973) note peak stonecat spawning occurs when water temperatures are at maximum, which in 2005 occurred on July 13.

4.5 Habitat Characteristics

Although no evidence of spawning or rearing was documented in 2005 possible spawning habitats (quiet backwaters and tributary mouths) were identified (Philip Coulee and the confluence of an unnamed stream) in 2004. These sites were to be sampled in the spring of 2005 via canoe due to limited access; however, the canoe trip was cancelled due to weather conditions. Another possible spawning site identified in 2005 may be the Bear Creek confluence as three adult female western silvery minnow were caught there in June 2005. In addition, several larval suckers were caught at this site indicating good rearing habitat. Similar to the possible spawning areas, silvery minnows may rear near quiet shoreline areas and in tributary mouths (Clayton and Ash 1980). Since some young-of-the-year western silvery minnow (40-45mm TL in October) were collected about 15 km downstream of the Aden Bridge, and given that young-of-the-year generally do not generally undertake substantial upstream movements, some rearing must be occurring in the area.

Quist *et al* (2004) found that the abundance of western silvery minnow was positively related to the percentage of fine substrate in a reach. Collection of detailed habitat was limited in 2000 due to the few western silvery minnow captured, however, the few individuals encountered were associated with sandy, shallow flat habitat types, characterized by low to moderated velocities and low silt deposition (RL&L 2001). During the drought in 2001, western silvery minnow were only captured at the mouths of coulees during the summer and during the fall they were caught in isolated pools (RL&L 2002).

Stash (2001) conducted a study in United States section of the Milk River from the Eastern Border Crossing to the Fresno Dam and encountered *Hybognathus* species in flat and run habitat types and particularly on the inside bend of the river. In the upper Missouri and Yellowstone rivers, Welker and Scarneccchia (2004) report collecting western silvery minnow mainly in channel habitat (extending from the river shoreline to the thalweg to a maximum depth of 1.5m). In addition, 98% of the western silvery minnow were captured in depths less than 1m, velocity less than 0.5m/s and water temperature between 18-22 °C. Habitat characteristics for western silvery minnow captured in the present study were generally consistent with this data. Western silvery minnow were mainly captured along the shoreline just downstream of inside meander bends or along mid channel sandbars. DFO reported an average velocity of 0.1m/s at sites where western silvery minnow were captured (D. Watkinson, pers. comm.).

5.0 SUMMARY

Consistent sampling throughout the summer and fall of 2005 found the abundance of western silvery minnow to be lower during the summer than the fall and that local abundance of the minnow generally increased with downstream distribution. In comparison to previous studies, there appears to be no substantial decline in the relative abundance and distribution of this species in the Milk River since 2000. Western silvery minnow were generally located in habitat with depth and turbidity for cover and no definitive answers were obtained about spawning habitat or the spawning strategy utilized by the western silvery minnow in 2005.

6.0 LITERATURE CITED

(ASRD)Alberta Sustainable Resource Development. 2003. Status of the Western Silvery Minnow *(Hybognathus argyritis)* in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No.47, Edmonton, AB. 24 pp.

(ASRD)Alberta Sustainable Resource Development. 2004. Status of the St. Mary shorthead sculpin (provisionally *Cottus bairdi punctulatus*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No.51, Edmonton, AB. 24 pp.

(ASRD)Alberta Sustainable Resource Development. 2004. Status of the stonecat (*Noturus flavus*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No.52, Edmonton, AB. 22 pp.

Altenbach, C.S., R.K. Dudley and S.P. Plantania. 2000. A new device for collecting drifting semibuoyant fish eggs. Transactions of the American Fisheries Society 129: 296-300.

Clayton, T.B. and G.R. Ash. 1980. A fisheries overview study of the Milk River basin. Prepared for Alberta Environment, Planning Division, Edmonton, AB. 93 pp. + App.

Cowley, D.E. 2003. Water requirements for endangered species in New Mexico. New Mexico Water Resources Research Institute. Pages 97-108 *in* Proceedings of the 47th New Mexico Water Conference.

Nelson, J.S. and M.J. Paetz. 1992. The fishes of Alberta. The University of Alberta Press, Edmonton, Alberta. 437 pp.

P&E Environmental Consultants Ltd. 2002. Fish species of concern survey on the Milk River, October 2002. Prepared for Alberta Sustainable Resource Development and Alberta Conservation Association. P&E Report No. 02018F: 12 pp. + 3 App.

Paetz, M.J. 1993. A management plan for the St. Mary shorthead sculpin (*Cottus* sp.) in Alberta. Prepared for World Wildlife Fund Canada and Alberta Fish and Wildlife Division. 21 pp. + App.

Plantania, S.P. and C.S. Altenbach. 1998.Reproductive strategies and egg types of seven Rio Grande basin cyprinids. *Copeia* 3: 559-569

Pollard, S. M. 2004. Milk River fish species recovery team. Compendium of information and meeting notes. Official binder.

Pollard, S. M. 2005. Western silvery minnow recovery plan. *Draft* report prepared for Alberta Sustainable Resource Development and Fisheries and Oceans Canada. 43 pp.

Quist, M.C., W.A. Hubert, and F.J. Rahel. 2004. Relations among habitat characteristics, exotic species, and turbid-river cyprinids in the Missouri river drainage of Wyoming. Transactions of the American Fisheries Society 133:727-742

Raney, E.C. 1939. The Breeding Habits of the Silvery Minnow, *Hybognathus regius* Girard. American Midland Naturalist 21: 674-680.

RL&L Environmental Services Ltd. 1987. An inventory of aquatic habitats and fish resources in the Milk River, Alberta. Prepared for Alberta Environment Planning Division. 80 pp. + App.

RL&L Environmental Services Ltd. 2002. Fish species at risk in the Milk and St. Mary drainages. Report prepared for Alberta Sustainable Resource Development. Fish and Wildlife Division – Prairie Region. RL&L Report No. 012-7001D: 80 pp + 5 App.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada. Bulletin 184. Ottawa, ON. 966 pp.

Simon, T.P. 1999. Assessment of Balon's reproductive guilds with application to Midwestern North American fishes. Pages 97-112 *in* T.P. Simon, editor. Assessing the sustainability and biological integrity of water resources using fish communities, Boca Raton, Florida.

Stash, S.W. 2001. Distribution, relative abundance and habitat associations of Milk River fishes related to irrigation dams. M.Sc. Thesis, Montana State University, Bozeman MT. 67 pp.

Welker, T.L. and D.L. Scarnecchia, 2004. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and lower Yellowstone rivers, North Dakota (USA). Ecology of Freshwater Fish 13:8-22.

Willock, T.A. 1969. The ecology and zoogeography of fishes in the Missouri (Milk River) drainage of Alberta. M.Sc. Thesis. Carleton University, Ottawa, Ontario.

Yu, S.L. and E.J. Peters. 2003. Diel and seasonal abundance of fishes in the Platte River, Nebraska, USA. Fisheries Science 69: 154-160

7.0 PERSONAL COMMUNICATIONS

Doug Watkinson, Department of Fisheries and Oceans Canada - Freshwater Institute, Winnipeg, Manitoba.

Appendix D

Access sites for sampling the Milk River, 2005.

Site #	Access Site Description	Easting	Northing
1	Police Creek Confluence – Writing on Stone Rodeo Grounds	452592	5436177
2	Writing on Stone Provincial Park	455196	5436798
3	Deer Creek Bridge	460778	5437353
4	Deer Creek Confluence	462304	5437672
5	Between Deer Creek Confluence and Macdonald Creek Confluence	467987	5441589
6	Macdonald Creek Confluence	472374	5440844
7	Aden Bridge	477587	5443699
8	Between Aden Bridge and Breed Creek Confluence	478401	5443744
9	Breed Creek Confluence	479101	5444329
10	Bear Creek Confluence / Ross Ranch	485048	5444223
11	Pinhorn Ranch	508278	5442036
12	Milk River Natural Area	522736	5432579

** All UTM locations in zone 12U*

Appendix E

Habitat where western silvery minnow were captured in 2005. Habitat pictures are presented from upstream to downstream sites.

1. Beach at Writing on Stone Provincial Park.

2. Mid-channel island between Deer Creek and Macdonald Creek.

3. Shoreline just downstream of Aden Bridge (15 June 2005).

4. Just downstream of Breed Creek Confluence.

5. Ross Ranch – Bear Creek Confluence (22 June 2005) and Milk River - mid channel sandbar.

6. Pinhorn Ranch

6. Pinhorn Ranch continued.

7. Milk River Natural Area.

Appendix F

Life history data for western silvery minnow captured in the Milk River, 2005.

Date	Species	Fork Length (mm)	Total Length (mm)	Weight (g)	Access Site	Easting	Northing
15-Jun	WSMN	89	98	8.2	7	477600	5443662
15-Jun	WSMN	91	105	9	7	477600	5443662
21-Jun	WSMN	63	70	3	11	509260	5441248
22-Jun	WSMN	91	109	11	10	485052	5444223
22-Jun	WSMN	101	114	12	10	485052	5444223
22-Jun	WSMN	115	129	19.7	10	485052	5444223
30-Jun	WSMN	86	95	8	3	460522	5437108
7-Jul	WSMN	105	118	16	10	485026	5444297
12-Jul	WSMN	91	102	9	9	479646	5444541
19-Jul	WSMN	101	114	11	11	510685	5441465
20-Jul	WSMN	105	119	16	10	485145	5444262
26-Jul	WSMN	56	61		12	522720	5432601
26-Jul	WSMN	59	64	2	12	522838	5432441
26-Jul	WSMN	59	65	3	12	522838	5432441
26-Jul	WSMN	60	66	2	12	522720	5432601
26-Jul	WSMN	62	68	3	12	522838	5432441
26-Jul	WSMN	66	71	3	12	522838	5432441
26-Jul	WSMN	67	74	4	12	522838	5432441
26-Jul	WSMN	71	77	5	12	522838	5432441
26-Jul	WSMN	73	79	3	12	522838	5432441
26-Jul	WSMN	86	95	6	12	522838	5432441
26-Jul	WSMN	94	105	9	12	522838	5432441
26-Jul	WSMN	95	109	8	12	522838	5432441
26-Jul	WSMN	108	119	14	12	522838	5432441
29-Jul	WSMN	86	94	7	5	468002	5441566
29-Jul	WSMN	90	101		5	468002	5441566
5-Aug	WSMN	87	96	7	8	478382	5443720
5-Aug	WSMN	93	104	8	8	478382	5443720
5-Aug	WSMN	100	111	10	8	478382	5443720
9-Aug	WSMN	68	74	3	12	522838	5432439
9-Aug	WSMN	70	76	4	12	522838	5432439
9-Aug	WSMN	72	80	5	12	522736	5432584
9-Aug	WSMN	85	92	5	12	522838	5432439
9-Aug	WSMN	85	92	6	12	522838	5432439
9-Aug	WSMN	93	104	10	12	522838	5432439
9-Aug	WSMN	97	107	11	12	522838	5432439
9-Aug	WSMN	100	111	11	12	522838	5432439
11-Aug	WSMN	88	97	11	8	468026	5441592
12-Aug	WSMN	91	102	7	2	455184	5436751
12-Aug	WSMN	101	112	10	2	455184	5436751
16-Aug	WSMN	77	85	5	12	508418	5441973
19-Aug	WSMN	116	126	17	10	486104	5444142
25-Aug	WSMN	98	110		10	485019	5444304
25-Aug	WSMN	100	112		10	485041	5444257

25-Aug	WSMN	101	111		10	484972	5444291
25-Aug	WSMN	104	115		10	484972	5444291
25-Aug	WSMN	106	118		10	484972	5444291
25-Aug	WSMN	107	117		10	485041	5444257
25-Aug	WSMN	110	121		10	484972	5444291
25-Aug	WSMN	115	127		10	485019	5444304
3-Oct	WSMN	48	54	1	11	508288	5441947
3-Oct	WSMN	51	55		11	508288	5441947
3-Oct	WSMN	54	58	1	11	508288	5441947
3-Oct	WSMN	55	61	1	11	508288	5441947
3-Oct	WSMN	55	61	1	11	508288	5441947
3-Oct	WSMN		49		11	508301	5441686
3-Oct	WSMN		42		11	508301	5441686
4-Oct	WSMN	70	77	2	7	477482	5443671
6-Oct	WSMN	70	79	4	10	485831	5444236
6-Oct	WSMN		52		10	485987	5444109
6-Oct	WSMN		47		10	485987	5444109
6-Oct	WSMN		45		10	485987	5444109
6-Oct	WSMN		47		10	485987	5444109
6-Oct	WSMN		48		10	485987	5444109
6-Oct	WSMN		49		10	485987	5444109
6-Oct	WSMN		44		10	485937	5444104
6-Oct	WSMN		44		10	485937	5444104
6-Oct	WSMN		45		10	485937	5444104
6-Oct	WSMN		45		10	485937	5444104
6-Oct	WSMN		42		10	485937	5444104
6-Oct	WSMN		45		10	485937	5444104
6-Oct	WSMN		45		10	485937	5444104
6-Oct	WSMN		42		10	485937	5444104
6-Oct	WSMN		52		10	485937	5444104
12-Oct	WSMN	53	59	1	11	508411	5441984
12-Oct	WSMN	60	67		11	508647	5441968
12-Oct	WSMN	65	72	4	11	508355	5442024
12-Oct	WSMN	66	73	2	11	508355	5442024
12-Oct	WSMN	68	75	4	11	508355	5442024
12-Oct	WSMN	70	77	3	11	508355	5442024
12-Oct	WSMN	72	80	4	11	508355	5442024
12-Oct	WSMN	88	99	7	11	508355	5442024
12-Oct	WSMN	90	102	8	11	508302	5441996
12-Oct	WSMN	99	109	9	11	508647	5441968
12-Oct	WSMN	100	109	10	11	508647	5441968
12-Oct	WSMN		44		11	508647	5441968
13-Oct	WSMN	62	69		7	477746	5443623
13-Oct	WSMN	65	74		7	477746	5443623

Appendix G

Life history data for stonecats captured in the Milk River, 2005.

Date	Species	Total Length (mm)	Weight (g)	Access Site	Easting	Northing
15-Jun	STON	99	11	7	477594	5443649
23-Jun	STON	88	8	9	479108	5444332
28-Jun	STON	86	12	4	462307	5437661
28-Jun	STON	159	53	4	462317	5437652
8-Jul	STON	70	3	1	452555	5436193
13-Jul	STON	90	5	3	460804	5437519
13-Jul	STON	160	43	3	460798	5437518
26-Jul	STON	160	45	3	460798	5437518
26-Jul	STON	153	32	3	460798	5437518
29-Jul	STON	185	55	5	467923	5441444
29-Jul	STON	180	52	5	467936	5441466
29-Jul	STON	165	49	5	467936	5441466
29-Jul	STON	122	18	5	467936	5441466
3-Aug	STON	168	43	11	508158	5441505
3-Aug	STON	166	43	11	508158	5441505
3-Aug	STON	176	56	11	508172	5441491
3-Aug	STON	194	66	11	508285	5442035
3-Aug	STON	224	97	11	508285	5442035
3-Aug	STON	195	73	11	508285	5442035
3-Aug	STON	220	126	11	508285	5442035
4-Aug	STON	130	18	10	484917	5444322
4-Aug	STON	140		10	484958	5444289
4-Aug	STON	139	26	10	484958	5444289
4-Aug	STON	134	26	10	484958	5444289
8-Aug	STON	233	113	3	460775	5437343
9-Aug	STON	103	11	3	460752	5437331
9-Aug	STON	130	19	3	460775	5437343
9-Aug	STON	116	14	3	460773	5437552
10-Aug	STON	87	6	7	477316	5443396
12-Aug	STON	164	53	1	452450	5436266
16-Aug	STON	173	53	11	508276	5442032
16-Aug	STON	197	67	11	508276	5442032
16-Aug	STON	183	64	11	508276	5442032
16-Aug	STON	224	126	11	508276	5442032
16-Aug	STON	216	136	11	508276	5442032
16-Aug	STON	247	173	11	508276	5442032
24-Aug	STON	148		6	472231	5440917
24-Aug	STON	85		6	472396	5440880
17-Nov	STON	120	15	7	477557	5443701
17-Nov	STON	200	66	7	477557	5443701

CHAPTER 5

FUTURE DIRECTION

2006-2007 Objectives

The MULTISAR program is a dynamic process, which considers aspects of wildlife biology and range management in order to achieve multiple species conservation. The vision of the MULTISAR program is that multiple species of wildlife, including species at risk, are effectively conserved at the landscape level, through a process that integrates range management with fish and wildlife management principles, and in a manner that contributes positively to the sustainability of the rural economy. It is succeeding due to the cooperation of all partners and the open communication MULTISAR provides with local community groups and landowners. The long-term goals developed for the program (refer to chapter 2) set out a clear direction to achieve the MULTISAR vision for wildlife management on the prairie. As of March 2006 the program has recognized the proactive management for wildlife species on over 62,000 acres, and provided practical management information to over 50% of residents in the program area. The future success of the program will rely on the continued partnerships between landowners, wildlife and range managers.

In 2006-2007 the MULTISAR team will continue to focus on the MULTISAR conservation program and achieving the long-term goals of the program. To achieve the long term goals of the MULTISAR conservation program a list of objectives for the following fiscal year (2006-2007) was developed. These objectives include:

- Initiate Habitat Conservation Strategies on 100,000 acres within the MULTISAR program area.
- Implement completed Habitat Conservation Strategies on 62,000 acres of land. Proposed projects included are:
    - Reseeding cultivation back to permanent cover in anticipation of native prairie seeding next year.
    - Fencing projects.
    - Development of a natural wetland.
    - Development of 2 off-stream watering systems.
- Continue monitoring wildlife transects on current conservation lands.
- Include recovery team action plans as deliverables through MULTISAR for the soapweed/yucca moth, western silvery minnow, western spiderwort, stonecat and St. Mary's sculpin.
- Continue educating the public on the positive effects of maintaining habitat for wildlife on their land.
- Work collaboratively with other conservation organization within the program area.
- Participate in the planning and delivery of a grazing school that focuses on sustainable rangeland management with the Milk River Watershed Council Canada, OGC, Cows and Fish, Agriculture Canada, and the Counties of Warner, Forty-mile/ Cypress, and Cardston.
- Complete a landowner friendly stewardship guide that provides information on species at risk and native prairie conservation.
- Develop a rapid assessment field format for small scale MULTISAR projects.

List of Titles in This Series
(as of March 2006)

No. 1 Alberta species at risk program and projects 2000-2001, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2001)

No. 2 Survey of the peregrine falcon (*Falco peregrinus anatum*) in Alberta, by R. Corrigan. (2001)

No. 3 Distribution and relative abundance of the shortjaw cisco (*Coregonus zenithicus*) in Alberta, by M. Steinhilber and L. Rhude. (2001)

No. 4 Survey of the bats of central and northwestern Alberta, by M.J. Vonhof and D. Hobson. (2001)

No. 5 2000 survey of the Trumpeter Swan (*Cygnus buccinator*) in Alberta, by M.L. James and A. James. (2001)

No. 6 2000/2001 Brassy Minnow inventory at Musreau Lake and outlet, by T. Ripley. (2001)

No. 7 Colonial nesting waterbird survey in the Northwest Boreal Region – 2000, by M. Hanneman and M. Heckbert. (2001)

No. 8 Burrowing owl trend block survey and monitoring - Brooks and Hanna areas, by D. Scobie and R. Russell. (2000)

No. 9 Survey of the Lake Sturgeon (*Acipenser fulvescens*) fishery on the South Saskatchewan River, Alberta (June-September, 2000), by L.A. Winkel. (2000)

No. 10 An evaluation of grizzly bear-human conflict in the Northwest Boreal Region of Alberta (1991-2000) and potential mitigation, by T. Augustyn. (2001)

No. 11 Harlequin duck monitoring in the Northern East Slopes of Alberta: 1998-2000 preliminary results, by J. Kneteman and A. Hubbs. (2000)

No. 12 Distribution of selected small mammals in Alberta, by L. Engley and M. Norton. (2001)

No. 13 Northern leopard frog reintroduction. Raven River - Year 2 (2000), by K. Kendell. (2001)

No. 14 Cumulative effects of watershed disturbances on fish communities in the Kakwa and Simonette watersheds. The Northern Watershed Project. Study 3 Progress report, by T. Thera and A. Wildeman. (2001)

No. 15 Harlequin duck research in Kananaskis Country in 2000, by C.M. Smith. (2001)

No. 16 Proposed monitoring plan for harlequin ducks in the Bow Region of Alberta, by C.M. Smith. (2001)

No. 17 Distribution and relative abundance of small mammals of the western plains of Alberta as determined from great horned owl pellets, by D. Schowalter. (2001)

No. 18 Western blue flag (*Iris missouriensis*) in Alberta: a census of naturally occurring populations for 2000, by R. Ernst. (2000)

No. 19 Assessing chick survival of sage grouse in Canada, by C.L. Aldridge. (2000)

No. 20 Harlequin duck surveys of the Oldman River Basin in 2000, by D. Paton. (2000)

No. 21 Proposed protocols for inventories of rare plants of the Grassland Natural Region, by C. Wallis. (2001)

No. 22 Utilization of airphoto interpretation to locate prairie rattlesnake (*Crotalus viridis viridis*) hibernacula in the South Saskatchewan River valley, by J. Nicholson and S. Rose. (2001)

No. 23 2000/2001 Progress report on caribou research in west central Alberta, by T. Szkorupa. (2001)

No. 24 Census of swift fox (*Vulpes velox*) in Canada and Northern Montana: 2000-2001, by A. Moehrenschlager and C. Moehrenschlager. (2001)

No. 25 Population estimate and habitat associations of the long-billed curlew in Alberta, by E.J. Saunders. (2001)

No. 26 Aerial reconnaissance for piping plover habitat in east-central Alberta, May 2001, by D.R.C. Prescott. (2001)

No. 27 The 2001 international piping plover census in Alberta, by D.R.C. Prescott. (2001)

No. 28 Prairie rattlesnake (*Crotalus viridis viridis*) monitoring in Alberta – preliminary investigations (2000), by S.L. Rose. (2001)

No. 29 A survey of short-horned lizard (*Phrynosoma hernandesi hernandesi*) populations in Alberta, by J. James. (2001)

No. 30 Red-sided garter snake (*Thamnophis sirtalis parietalis*) education and relocation project – final report, by L. Takats. (2002)

No. 31 Alberta furbearer harvest data analysis, by K.G. Poole and G. Mowat. (2001)

No. 32 Measuring wolverine distribution and abundance in Alberta, by G. Mowat. (2001)

No. 33 Woodland caribou (*Rangifer tarandus caribou*) habitat classification in northeastern Alberta using remote sensing, by G.A. Sanchez-Azofeifa and R. Bechtel. (2001)

No. 34 Peregrine falcon surveys and monitoring in the Parkland Region of Alberta, 2001, by R. Corrigan. (2002)

No. 35 Protocol for monitoring long-toed salamander (*Ambystoma macrodactylum*) populations in Alberta, by T. Pretzlaw, M. Huynh, L. Takats and L. Wilkinson. (2002)

No. 36 Long-toed salamander (*Ambystoma macrodactylum*) monitoring study in Alberta: summary report 1998-2001, by M. Huynh, L. Takats and L. Wilkinson. (2002)

No. 37 Mountain plover habitat and population surveys in Alberta, 2001, by C. Wershler and C. Wallis. (2002)

No. 38 A census and recommendations for management for western blue flag (*Iris missouriensis*) in Alberta, by R. Ernst. (2002)

No. 39 Columbian mountain amphibian surveys, 2001, by D. Paton. (2002)

No. 40 Management and recovery strategies for the Lethbridge population of the prairie rattlesnake, by R. Ernst. (2002)

No. 41 Western (*Aechmophorus occidentalis*) and eared (*Podiceps nigricollis*) grebes of central Alberta: inventory, survey techniques and management concerns, by S. Hanus, H. Wollis and L. Wilkinson. (2002)

No. 42 Northern leopard frog reintroduction – year 3 (2001), by K. Kendell. (2002)

No. 43 Survey protocol for the northern leopard frog, by K. Kendell. (2002)

No. 44 Alberta inventory for the northern leopard frog (2000-2001), by K. Kendell. (2002)

No. 45 Fish species at risk in the Milk and St. Mary drainages, by RL&L Environmental Services Ltd. (2002)

No. 46 Survey of the loggerhead shrike in the southern aspen parkland region, 2000-2001, by H. Kiliaan and D.R.C. Prescott. (2002)

No. 47 Survey of native grassland butterflies in the Peace parkland region of northwestern Alberta – 2001, by M. Hervieux. (2002)

No. 48 Caribou range recovery in Alberta: 2001/02 pilot year, by T. Szkorupa. (2002)

No. 49 Peace parkland native grassland stewardship program 2001/02, by A. Baker. (2002)

No. 50 Carnivores and corridors in the Crowsnest Pass, by C. Chetkiewicz. (2002)

No. 51 2001 Burrowing owl trend block survey and monitoring, Brooks and Hanna areas, by D. Scobie. (2002)

No. 52 An evaluation of the ferruginous hawk population in Alberta based on recent trend data, by D.P. Stepnisky, G.L. Erickson, J. Iwaasa and B. Taylor. (2002)

No. 53 Alberta amphibian call surveys. A pilot year. Final report, by L. Takats and C. Priestley. (2002)

No. 54 Utilization of a roadside survey technique to survey burrowing owl (*Athene cunicularia hypugaea*) in southeastern Alberta, by J. Nicholson and C. Skiftun. (2002)

No. 55 Alberta species at risk program and projects 2001-2002, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2002)

No. 56 Developing a habitat-based population viability model for greater sage-grouse in southeastern Alberta, by C.L. Aldridge. (2001)

No. 57 Peregrine falcon surveys and monitoring in the Northeast Boreal Region of Alberta, 2001, by R. Corrigan. (2002)

No. 58 2002 burrowing owl trend block survey and monitoring, Brooks area, by R.F. Russell. (2002)

No. 59 Rare plant inventory of the eastern edge of the lower foothills natural subregion, west-central Alberta, by J. Doubt. (2002)

No. 60 Western (*Aechmophorus occidentalis*) and eared (*Podiceps nigricollis*) grebes of central Alberta: 2002 field summary, by S. Hanus, L. Wilkinson and H. Wollis. (2002)

No. 61 Inventory of western spiderwort (*Tradescantia occidentalis*) in Alberta: 2002, by S. Peters. (2003)

No. 62 Bullsnakes (*Pituophis catenifer sayi*) in Alberta: literature review and data compilation, by K.J. Kissner and J. Nicholson. (2003)

No. 63 Distribution of Ord's kangaroo rats in southeastern Alberta, by D.L. Gummer and S.E. Robertson. (2003)

No. 64 Lethbridge prairie rattlesnake conservation project: 2002/2003 progress report, by R.D. Ernst. (2003)

No. 65 Short-horned lizard (*Phrynosoma hernandesi hernandesi*) populations in Alberta – 2002 survey results, by J.D. James. (2003)

No. 66 Inventory and monitoring protocol for naturally occurring western blue flag (*Iris missouriensis*) in Alberta, by R.D. Ernst. (2003)

No. 67 The use of call playbacks for censusing loggerhead shrikes in southern Alberta, by D.R.C. Prescott. (2003)

No. 68 Survey of bats in northeastern Alberta, by A. Hubbs and T. Schowalter. (2003)

No. 69 Survey protocol for the Richardson's ground squirrel, by B.A. Downey. (2003)

No. 70 Population estimates and a survey protocol for ferruginous hawks in Alberta, by B.N. Taylor. (2003)

No. 71 Testing methods for detecting wolverine, by G. Mowat, C. Kyle and D. Paetkau. (2003)

No. 72 A multi-species conservation strategy for species at risk in the Milk River basin: year 1 progress report, by R.W. Quinlan, B.A. Downey, B.N. Taylor, P.F. Jones and T.B. Clayton. (2003)

No. 73 Long-toed salamander (*Ambystoma macrodactylum*) conservation in the Alberta foothills: 2002 field summary report, by L. Wilkinson and S. Hanus. (2003)

No. 74 Researching Amphibian Numbers in Alberta (RANA): 2002 provincial summary, by L. Wilkinson and S. Hanus. (2003)

No. 75 Distribution and habitat associations of the long-toed salamander (*Ambystoma macrodactylum*) in the Oldman River drainage, by K. Pearson. (2003)

No. 76 Prairie rattlesnake (*Crotalus viridis*) hibernacula: monitoring history in Alberta 1987-2002, by K.J. Kissner and J. Nicholson. (2003)

No. 77 Alberta species at risk program and projects 2002-2003, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2003)

No. 78 Northern leopard frog reintroduction: Year 4 (2002), by K. Kendell. (2003)

No. 79 Magrath Northern Leopard Frog Reintroduction Project - Year 1 Progress Report, by K.A. Romanchuck. (2003)

No. 80 Conservation Overview of Butterflies in the Southern Headwaters at Risk Project (SHARP) Area, by N. Kondla. (2004)

No. 81 Lethbridge Rattlesnake Conservation Project: 2003 Progress Report, by R. Ernst. (2004)

No. 82 Shortjaw Cisco Species at Risk Assessment 2001, by M. Steinhilber. (2004)

No. 83 Researching Amphibian Numbers in Alberta (RANA): 2003 provincial summary, by L. Wilkinson and K. Kempin. (2004)

No. 84 Methods for Controlling Depredation on Piping Plovers in Alberta: A Literature Review and Synthesis, by R. Schmelzeisen, D.R.C. Prescott and L. Engley. (2004)

No. 85 Western Blue Flag Conservation Program: 3-Year Summary Report, by K.A. Romanchuk, R.D. Ernst, and R.W Quinlan (2004)

No. 86 MULTISAR: The Milk River Basin Habitat Suitability Models for Selected Wildlife Management Species, by B. A. Downey, B. L. Downey, R. W. Quinlan, O. Castelli, V. Remesz and P. F. Jones (eds.). (2004)

No. 87 MULTISAR: The Milk River Basin, A Multi-Species Conservation Strategy For Species at Risk: Year 2-Progress Report, by R.W. Quinlan, B. A. Downey, B. L. Downey, and P. F. Jones. (2004)

No. 88 Survey of Colonial Nesting Birds and Lakeshore Habitats in Northeast Alberta, by C. Found and A. Hubbs. (2004)

No. 89 The southern headwaters at risk project: A multi-species conservation strategy for the headwaters of the Oldman River. Volume 1: Introduction and natural processes, by F. Blouin. (2004)

No. 90 The southern headwaters at risk project: A multi-species conservation strategy for the headwaters of the Oldman River. Volume 2: Species Selection and Habitat Suitability Models, by F. Blouin, B.N.Taylor, and R.W.Quinlan (eds). (2004)

No. 91 Distribution, abundance and habitat selection of northern pygmy and barred owls along the eastern slopes of the Alberta Rocky Mountains, by M. D. Piorecky and D. R. C. Prescott. (2004)

No. 92 Survey of Aquatic Gastropods in the Central Parkland Subregion of Alberta, by D. R. C. Prescott, and M. M. Curteanu. (2004)

No. 93 The 2003 Loggerhead Shrike Survey in Alberta, by D. R. C. Prescott. (2004)

No. 94 Western (*Aechmophorus occidentalis*) and Eared (*Podiceps nigricollis*) Grebes of Central and Parkland Alberta: 2004 Field Summary, by G. Berg, L. Wilkinson, H. Wollis, and D. Prescott. (2004)

No. 95 Researching Amphibian Numbers in Alberta (RANA): 2004 provincial summary, by L. Wilkinson and G. Berg. (2004)

No. 96 Gillett's checkerspot in the southern headwaters at risk (SHARP) project area, by N.G. Kondla. (2005)

No. 97 Southern headwaters at risk project (SHARP) amphibian and western painted turtle (Chrysemys picta) surveys, 2003-2004, by K.J. Pearson. (2005)

No. 98 MULTISAR: A Multi-Species Conservation Strategy For Species at Risk: Year 3 Report, by B. L. Downey, B. A. Downey, R.W. Quinlan, and P. F. Jones. (2005)

No. 99 Implementation of the Alberta Piping Plover Recovery Plan, 2002-2004: Final Program Report, Alberta Piping Plover Recovery Team. (2005)

No. 100 Alberta Species at Risk Program and Projects 2003-2004, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2005)

No. 101. The 2005 ferruginous hawk inventory and population analysis, by B. L. Downey. (2005)

No. 102 Western Spiderwort (*Tradescantia occidentalis*) Inventory in Alberta, 2005, by B.L. Remarchuk. (2006)

No. 103 Inventory of the Pinhorn Soapweed (*Yucca glauca*) and Yucca moth (*Tegiticula yuccasella*) population, 2004, by K. Foreman, J. Chandler, and L. Matthias. (2006)

No. 104 Magrath Northern Leopard Frog Reintroduction Program: Final Report, by K. Romanchuk and R. Quinlan. (2005)

No 105 The Southern Headwaters at Risk Project: A Multi-Species Conservation Strategy for the Headwaters of the Oldman River, Volume 3, Landscape Management - Selection and Recommendations, by F. Blouin. (2006)

No 106 The Southern Headwaters at Risk Project: A Multi-Species Conservation Strategy for the Headwaters of the Oldman River Volume 4, BMP's and Land Use Guidelines for Focal Species, by F. Blouin. (2006)

No 107 The Southern Headwaters at Risk Project: A Multi-Species Conservation Strategy for the Headwaters of the Oldman River, Volume 5, Landscape Pressures on Wide-ranging Species, by F. Blouin. (2006)